PUBLIC WORKS

April 1954

CITY, COUNTY AND STATE

ivil Defense and Disaster Symposium .. 67

iofiltration for a Growing City 73

iant Water Project for 11 Texas Cities 75

unway Extension Makes Modern Airport ... 77

ational Design for Soil Absorption ... 79

vo-Way Radio Saves Time and Money .. 89

ifty Years of Dirt Moving Progress .. 97

Robert L. Lippman, City Engineer of Hammond, Ind., supervises street and sewer department activities, plus other work. See page 24.

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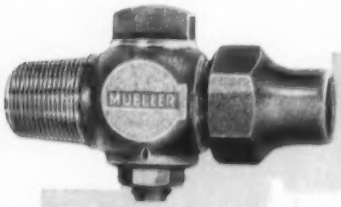
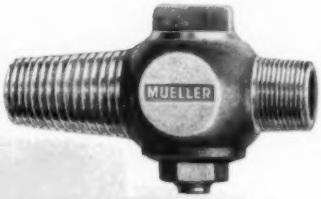


H-15000 with Mueller Thread inlet—straight copper coupling nut outlet

H-10002 with Mueller Thread inlet—lead flange outlet



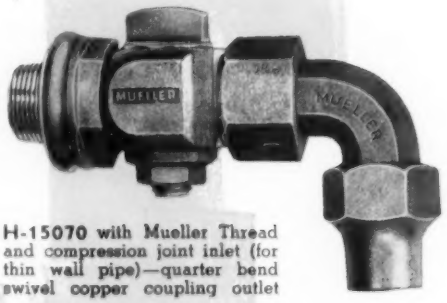
H-9990 with wood main thread inlet—I.P. thread outlet (same size as inlet)

CORPORATION STOPS *designed for your Specific needs!*

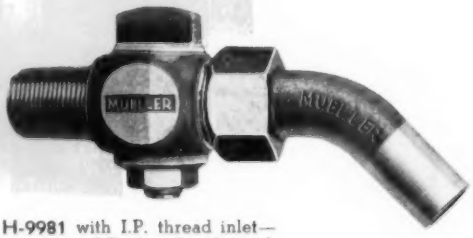
Since 1857, Mueller Co. has been vitally interested in the design and manufacture of high quality Water Works Bronze. This interest has resulted in the Mueller Thread—adopted as standard corporation stop thread by the AWWA, the introduction of copper service pipe and copper service connection thread design, as well as many other improvements for the water works industry.

All components of Mueller Corporation Stops are cast from Mueller Water Works Bronze; the key is precision ground and lapped into the body, and carefully tested and inspected. All exposed threads are accurately machined and coated with protective plastic, assuring arrival in an undamaged condition. This extra precaution also assures their quick, easy insertion into the main under pressure with your Mueller Tapping Machine.

Consult your Mueller Water Works Catalog W-96 or your Mueller Representative, or write direct for complete range of sizes and types.



H-15070 with Mueller Thread and compression joint inlet (for thin wall pipe)—quarter bend swivel copper coupling outlet



H-9981 with I.P. thread inlet—increasing I.P. thread outlet with eighth bend coupling for wiped joint

H-15035 with I.P. thread inlet—eighth bend copper coupling outlet

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MAIN OFFICE & FACTORY DECATUR, ILLINOIS

BARMINUTOR*

A New Comminution Development

CHICAGO SEWAGE EQUIPMENT

Barminutor installed in 5′ channel.

The Barminutor Model "A" exclusively provides the advantages of comminution with maximum economy for flows from 10 to 15 M.G.D. Screening and cutting of coarse sewage material is accomplished without removal from the flow, maintaining continuous cleaning of the screen. The Barminutor, developed and tested over five years, based on fifteen years successful experience with the Comminutor, eliminates odors and handling nuisance in the screening process. High rate cutting in the flow—comminution—provides low maintenance cost and long life for cutting parts.

In tests conducted on a Barminutor installed at the Indianapolis, Indiana Sewage Treatment Plant, the unit was subjected to test loads of screenings up to six times normal load for 40 M.G.D. This material was comminuted and the screen completely cleaned in six minutes. Even with this heavy load head loss through the screen did not exceed 6". Like the Comminutor, power requirements are low.

FUNCTION OF THE BARMINUTOR

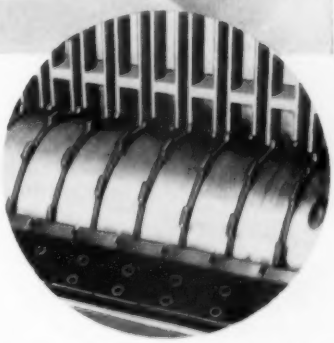
1. Cleaning the ¾" vertical bar screen and cutting of the screenings is accomplished by continual travel of the comminuting unit at 8 ft. per minute. Both upward and downward travel is controlled by an electric reversing brake motor.

2. The cutters on the comminuting unit, rotating at 400 R.P.M., travel within slots of the U-shaped bars and carry coarse material to the combs for cutting.

3. The direction of rotation automatically reverses when the direction of travel changes. The combs automatically position themselves to accomplish rapid cutting for each direction of rotation.

4. Uncuttable material is automatically rejected without damage to the cutting parts.

5. Rotation of cutters, position of combs and rejection of uncuttable material is accomplished through oil powered hydraulic system.



Close-up of Cutters and Combs. Cutters rotate within slots of Bar and Comb.

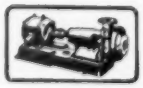
**Chicago Pump Company's trade name for its new screening and comminuting device for large sewage flows from 10 M.G.D.*

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

622 DIVERSEY PARKWAY — **CHICAGO 14, ILLINOIS**

Flush Kleen, Scru-Peller, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers.



Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.

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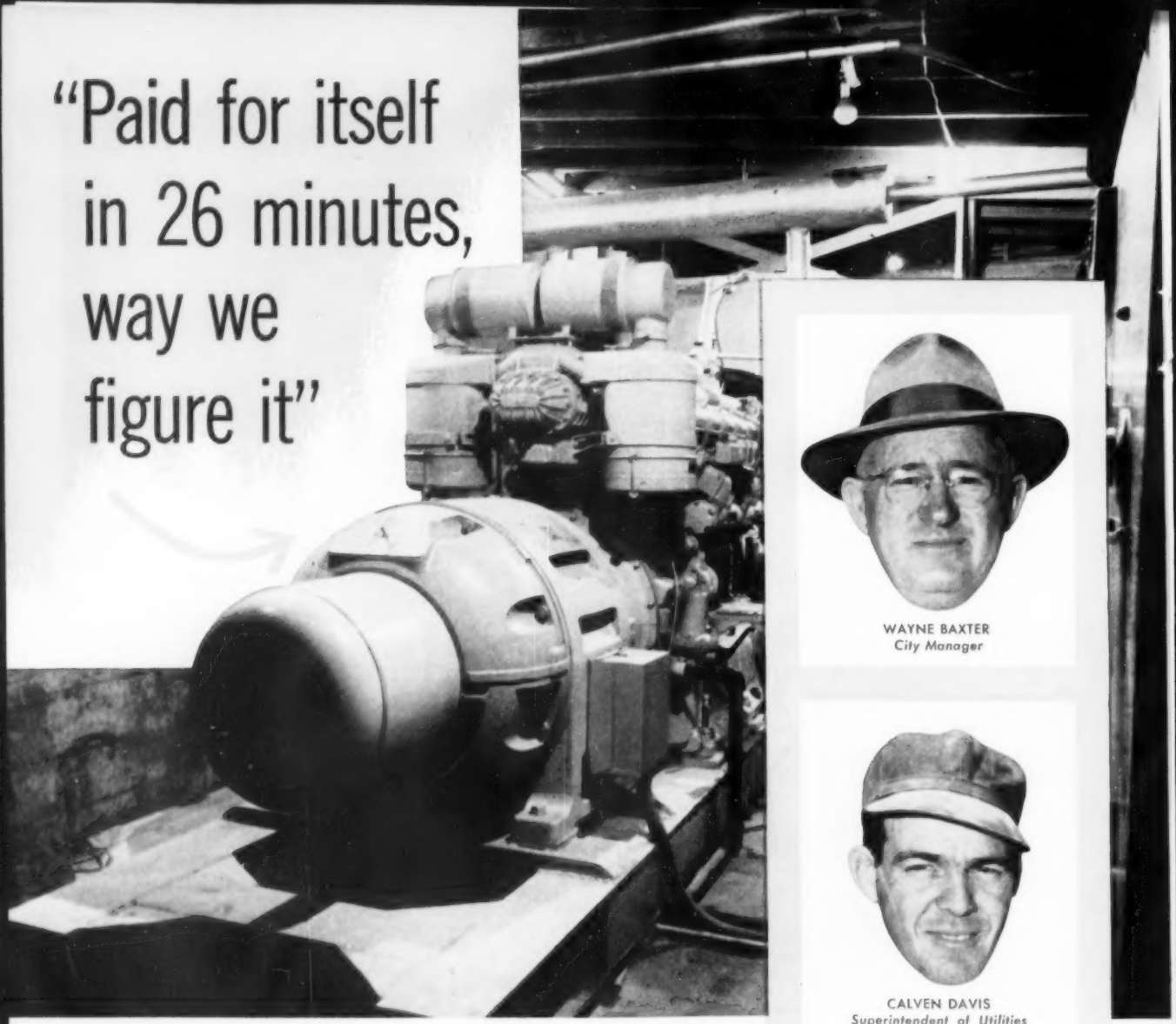
"Paid for itself in 26 minutes, way we figure it"



WAYNE BAXTER
City Manager

CALVEN DAVIS
Superintendent of Utilities

Back in 1951, the city of Larned, Kansas, installed a Cat® D397 Electric Set as part of its light plant. It was put in primarily to power a boiler feed pump, a circulating pump, and a condensate pump—and secondarily, to serve as emergency standby for the light and water systems in the event of regular power failure.

Says City Manager Wayne Baxter: "We put our D397 in a weatherproof building separate from the main plant. Even if the main plant should be cycloned, our standby source is safe. We've only had to use the D397 in one emergency so far—for 26 minutes—but we figure it about paid for itself in that time."

A lot of other city and town governments are choosing reliable Caterpillar Electric Sets and Engines for similar use as both regular and standby power. They're ready to step in when you need them in emergency or they'll provide steady power for tens of thousands of hours with a minimum of maintenance. They operate with maximum efficiency on low-cost No. 2 furnace oil, for lower fuel bills. Simply designed, easy to operate, there's a Caterpillar unit tailored to your needs — 12 sizes up to 315 KW and 500 HP. Your nearby Caterpillar Dealer will be glad to help you find the one that's just right for your town. Why not call him today?

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PUBLIC WORKS MAGAZINE

CONTENTS

April, 1954 **Vol. 85, No. 4**

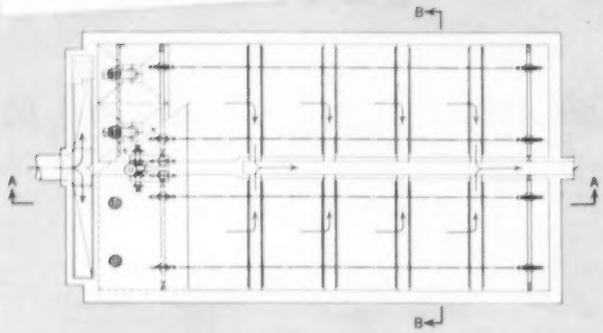
Civil Defense and Natural Disasters:
Transportation in Disasters and Emergencies 67
A-B-C of Radiation Hazards 69
Providing Safe Water in Emergencies 70
Insect and Rodent Control in Local Disaster Planning. *By Louis B. Read* 72
Biofiltration Serves a Growing City. *By Guy B. Arthur* 73
11 Texas Cities Join in Giant Pipeline and Dam Project. *By B. H. Cruce* 75
Airport Runway Extension Makes a Modern Field. *By R. K. Clifford* 77
Rational Resign for Ground Absorption. *By Owen G. Quenelle* 79
Houston—The New City of Light. *By Thomas Martin* 81
Repairing and Widening a Heavily Traveled Viaduct. *By John E. Hubel* 83
How to Improve Asphalt Quality. *By Walter F. Winters* 84
Organization for Water and Sewer Maintenance 86
For a Venturi—Life Begins at 40 88
Two-Way Radio Saves Time and Money for Maintenance Officials *By Phil Hirsch* 89
Low-Cost Street Paving Program. *By G. M. Harrington* 91
Municipal Power Plant Saves $11,700 in Year 92
Underground Water Pollution by Oilfield Brines. *By Carl B. Johnston* 93
Electronic Witch Takes Guesswork Out of Pipe Finding *By George M. MacLeod* 95
Fifty Years of Dirt Moving 97
Typical Pavement Modernization. *By R. A. Haber* 99
Records and Maps of the Water Distribution System. *By C. C. Williams* 107
Garbage Grinders and Sewage Treatment 110
Enzymes Give Good Results in Sewage Treatment Plant 116

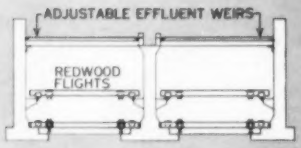
The Water Works Digest 118
The Highway and Airport Digest 126
The Sewerage and Refuse Digest 134

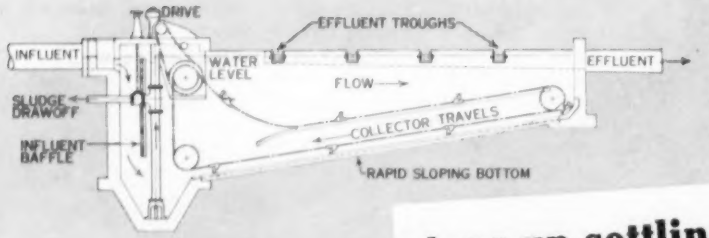
The Editor's Page 7
"Doc" Symons 14
"Jack" Ritter 16
Leaders in Public Works 24
Books in Brief 26
The Engineers' Library 38
Worth Telling. *By A. K. Akers* 154
Public Works Engineering Data 58
APWA News 101
Washington News 103
Lighting and Traffic Control 112
New Public Works Equipment 145
Worth Seeing 153

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

New UNIFLOW settling tank







Link-Belt's new UNIFLOW settling tank can be utilized for economical removal of solids from water, sewage or industrial liquids. Uniflow tanks are equipped with Link-Belt Straight-line Sludge Collectors which will remove sludge from the tank floor and scum from the surface.

steps up settling efficiencies . . cuts construction costs

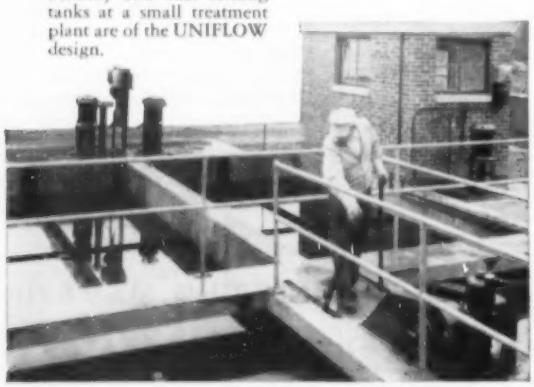
LINK-BELT development offers new economies for water, sewage and industrial liquids treatment

With its rapidly sloping bottom and multiple effluent weirs, Link-Belt's new UNIFLOW settling tank represents a big design advance. These, combined with the decreasing cross sectional area, provide *uniform velocity throughout the tank.*

Result: Better settling conditions . . . low overflow rate . . . uniform discharge from a large area of the tank surface. In fact, on one New England experimental installation, UNIFLOW gave practically the same efficiency in B.O.D. and suspended solids removal as a conventional tank with one-third more volume.

The new economies possible with UNIFLOW are typical of the development work constantly under way at Link-Belt. If you have a water, sewage or industrial waste problem, our engineers will work with your engineers, chemists and consultants. They'll help you get the finest in modern treatment equipment.

Primary and final settling tanks at a small treatment plant are of the UNIFLOW design.



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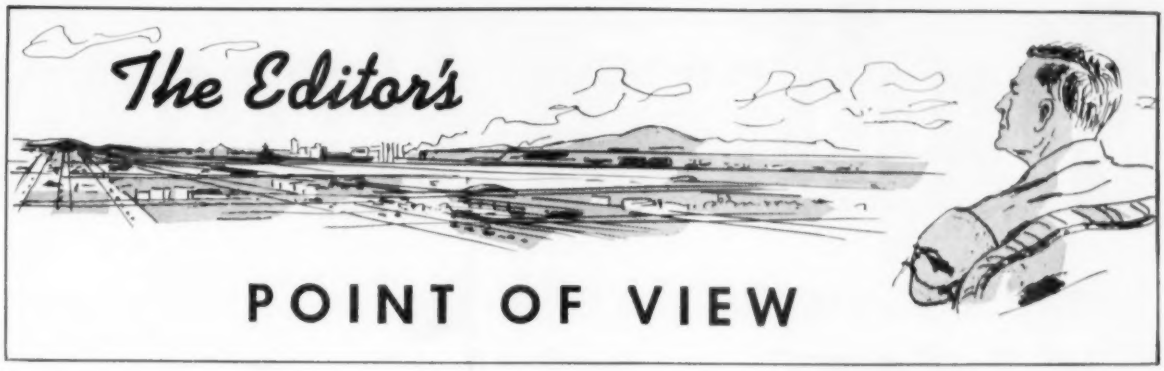
SANITARY ENGINEERING EQUIPMENT



There Are Still Plenty of Places for Using New Ideas

IN THE excellent report of the Cranston, R. I., sewage treatment plant for the past year is an item to the effect that, soon after the plant started ten or more years ago, an enterprising oil company representative surveyed all the equipment in it and drew up a lubrication chart which has been followed ever since. The result has been that after more than ten years of operation the equipment is "still in first class condition." Here is a lesson for both lubrication salesmen and municipalities.

Thousands of commuters use the Erie ferries every day in their journeys from their homes in New Jersey to their offices in New York. Among them must be some conveying equipment engineers; and they must have noticed the remarkably archaic method of taking cinders out of the boiler rooms of the Erie ferryboats. There is a truck and there are three men in sight, and no one knows how many men below, out of sight. Well, someone below shovels cinders into a 10 or 20-gallon can and the three men and the truck horse these cans up one by one and empty them into the truck. Modern concepts have entered the picture to the extent that now the power takeoff is used for hoisting the cans; but the unit cost must be right remarkable.

Has the Erie never been exposed to a good sales talk on the values of labor saving equipment; or is that just the Erie's way of doing things? Whatever the reason, those are sure gold-plated cinders by the time they are disposed of. We shudder to think how a city would get along if it used such methods—and we hope none is.

Data on Water Use by Industry Being Collected

IN view of the need for compiling broad data on the industrial utilization of water, the Division of Water Pollution Control of the Public Health Service and the Bureau of the Census have arranged to include in the 1954 Annual Survey of Manufactures some questions on industrial water usage during 1953. This is a very fine step forward. Not only should this initial step produce some interesting and valuable data, but it should have two other important reactions: As we know in this office, it is difficult to frame a questionnaire so precisely the first time as to get exactly what is wanted. Experience is necessary, and next year even more valuable information should be obtained. Also, this matter of water for the nation is so important that every government agency ought to be interested in it; and such agencies as the Bureau of the Census, which have facilities for gathering or utilizing essential data ought to be brought into the picture. Doing this is a sound step toward the bearings we need for the future.

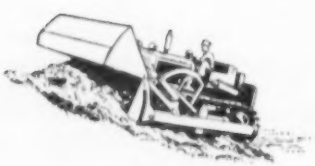
Fifty Years of the Crawler Tractor or the Economic Results of Mechanization

"GONE now are Patrick with his pick and Michael with his shovel. So are Gustaf with his team and wagon and Heinrich with his mules and scraper." This is a quotation from a recent speech by a tractor company official, and it summarizes well what fifty years of development in dirt moving has done; and he goes on to tell of related changes. This has been done so well that we shall merely take a bit here and there from the speech.

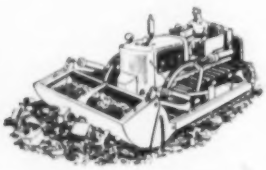
Today Pat's son drives a big tractor and he averages $2.75 an hour—about what his father made in two days; and he can do as much work with his bulldozer as a thousand men with picks and shovels; in an hour he can move more dirt a hundred feet than ten men with scoops and teams could move in a 10-hour day. Heinrich's son Henry, with his self-loading scraper can haul more dirt 400 feet in an hour than 50 men with scrapers and 4-horse teams. The second-generation Gus drives a big dirt-mover truck that is loaded with 22 tons of material in 3 or 4 minutes by Mike's son operating a power shovel. No longer do the Pats and Mikes work from dawn to dusk six days a week—but it costs little more, if any, to move dirt today than it did fifty years ago. And the speed with which the work is done today is a major factor in our ability to do things. We could not carry out a fraction of our present-day construction program if we had to rely on old-time methods and equipment. We certainly owe much to the giants of older days who were not content with things as they were, but developed a new world of mechanization for the benefit of all.

Stadium Grows

NEARLY 850 CUBIC YARDS of refuse is dumped daily at the Gary sanitary landfill site, then spread and compacted by the city's INTERNATIONAL TD-14A and Drott Bullclam.

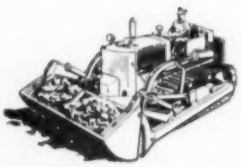


1. Prepares the site



2. Crushes and compacts refuse

3. Transports and spreads earth cover



4. Grades and levels finished area

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From Swamp

City of Gary, Indiana, Uses Sanitary Landfill to Build New Recreational Site

Down in Gary, Indiana, the Street Department is converting worthless swamp land into the future site of a football field and stadium through the Bullclam Shovel Method of Sanitary Landfill of garbage disposal.

It works this way.

Under the direction of Superintendent of Streets, Glen Smith, garbage is dumped into the open swamp, then spread and compacted by the city's INTERNATIONAL TD-14A and Drott Bullclam. When a firm foundation has been established . . . and it doesn't take long . . . a shovel scoops up rich top soil to cover the dry, stable, refuse-built land.

The INTERNATIONAL Crawler-Drott Bullclam unit spreads the rich cover dirt over the compacted refuse. And as this operation is repeated day after day, the new land moves slowly across the swamp, constantly coming closer to the day when the landfill project will be completed and turned over to the City of Gary Athletic Department for development of the stadium and the football field.

"The INTERNATIONAL-*Drott unit working on our sanitary landfill operation is actually making money for the city,"* according to Superintendent Smith. *"Instead of paying to dump refuse, we're using it to build land. We're getting paid with new property for needed parks and playgrounds."*

Only the INTERNATIONAL Crawler with matched Drott Bullclam is specifically designed for the Bullclam Shovel Method of Sanitary Landfill . . . and it's the only "one-man sanitation squad" for all four steps of the job.

We'll help you select the site, train your operators. For details, see your INTERNATIONAL Industrial Distributor or write:

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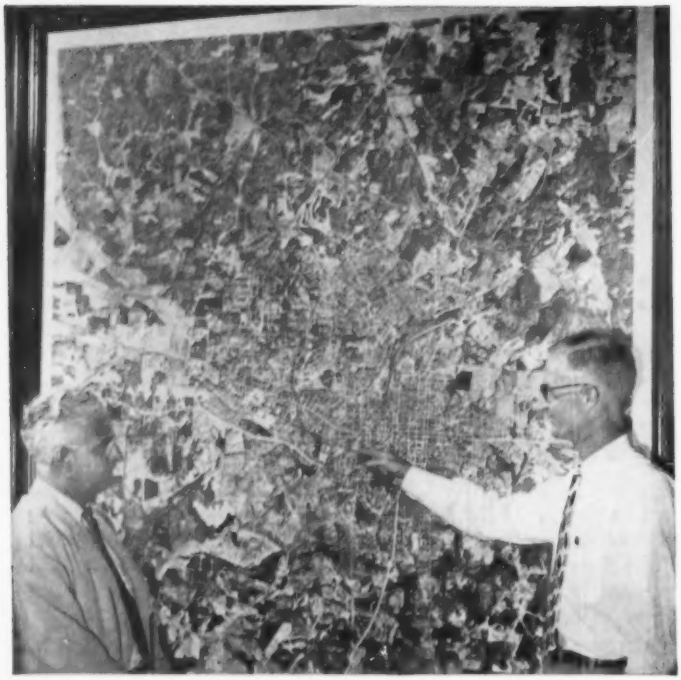

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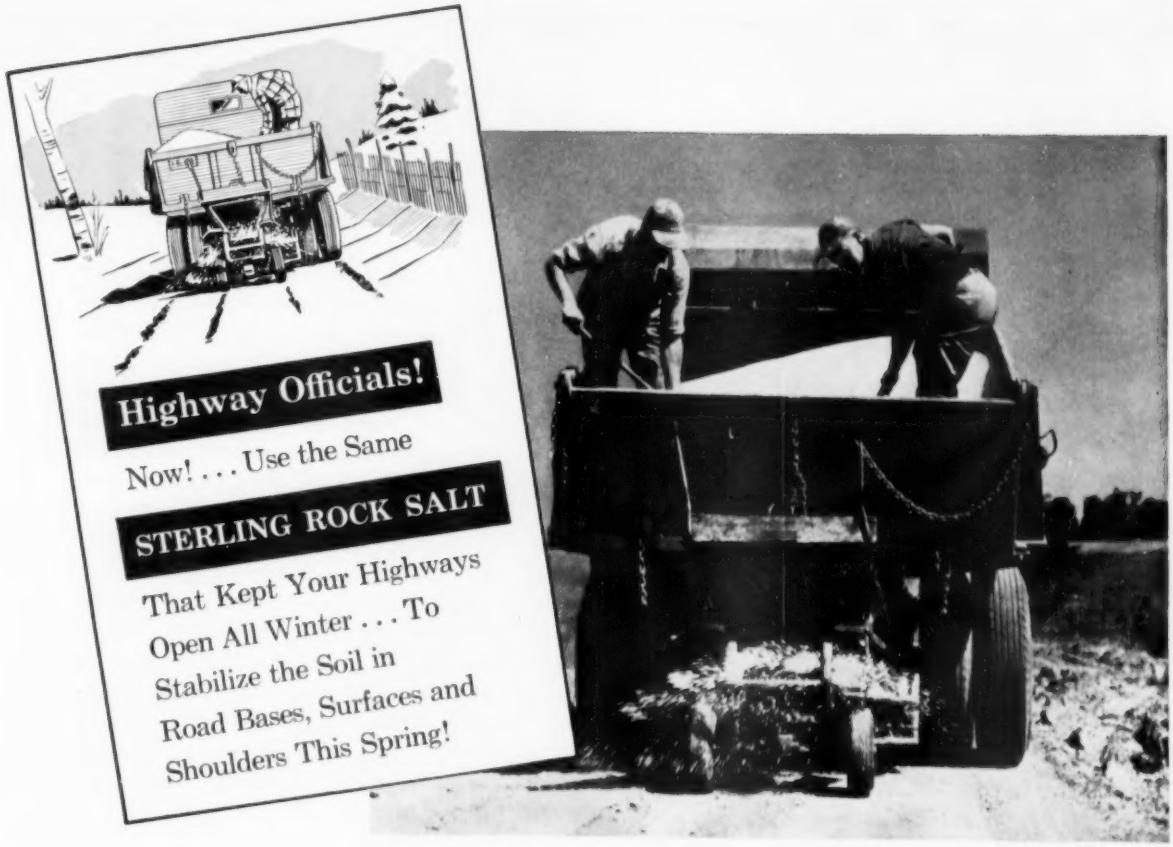
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"Nature's Own Soil Stabilizer"

STERLING ROCK SALT

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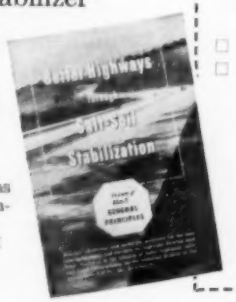

INTERNATIONAL SALT CO., INC.
Industrial Division, Scranton 2, Pa.

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☐ Please put me on your list to receive "Better Highways" Bulletins.

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Title _____ Dept. _____

Street _____

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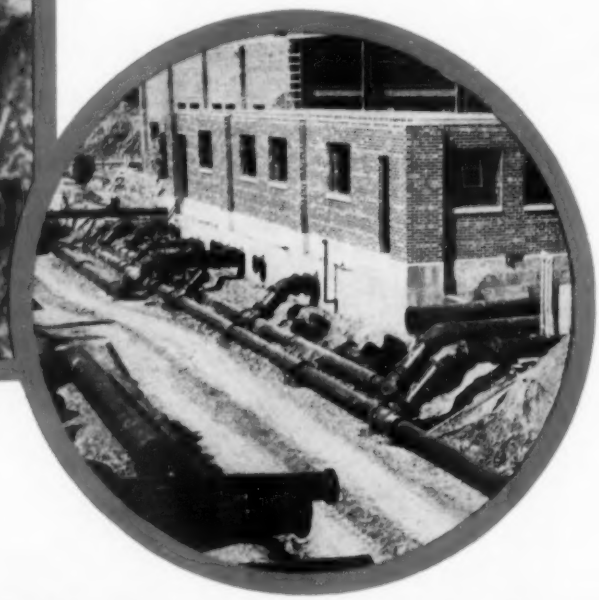
For TOUGH assignments

When pipe is to be installed under conditions which make repairs difficult at best, the engineering profession relies on cast iron pipe. Such installations, for example, as outfall sewers, river crossings, and sealed piping in sewage treatment and water filtration plants. *Any* installation, where repairs should be a remote possibility, calls for rugged cast iron pipe. Its great beam-strength, compressive-strength and shock-strength—plus its effective resistance to corrosion—result in long life with negligible repairs and maintenance cost. For information write: Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.



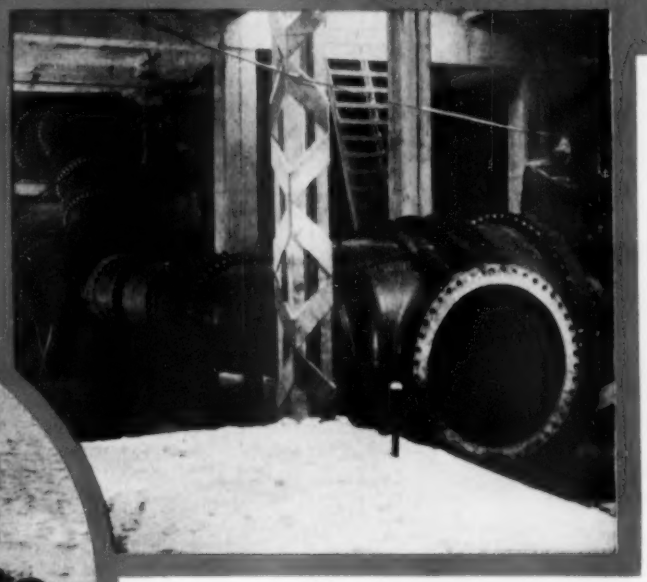
(above)
Installing cast iron belt feeder main for water supply system in Casper, Wyoming.

(right)
Cast iron pipe for discharge lines from water circulating pump house in a midwest oil refinery.

CAST IRON PIPE

Now's the time to mail this month's Reader's Service card.

use this RUGGED pipe



(above)
Cast iron pipe for outfall into St. Joseph Sound from sewage disposal plant at Dunedin, Fla.

(top right)
Cast iron pipe and fittings installed in world's largest water filtration plant in Chicago, Ill.

(at right)
Installing 30" cast iron pipe for sewage treatment plant at Panama City, Fla.

SERVES FOR CENTURIES...

It's a fact... our handy Readers' Service card is the way to get new catalogs.

flatten cost curves with UNIVERSAL Flat-base pipe

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Pre-cast concrete pipe saves up to 30% over built-in-place methods. Easy installation. Up to 100 feet of UNIVERSAL Flat-base pipe can be laid and covered in one day!

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THE UNIVERSAL CONCRETE PIPE COMPANY
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A subsidiary of the American-Marietta Co.

People, Ideas and Events

BY "DOC" SYMONS

H.T.M.A. — And next month is the big AWWA affair in Seattle. I understand that advance registration is quite heavy—Hope to see you there!

★ ★ ★

One Reply—Some Guy — To my question about the two numbers on a folding rule (January issue), I received one answer — correct too. Came from a fellow, name of Bob Lenon of Patagonia, Ariz., whose letterhead proclaims him to be Town Clerk and Town Engineer, as well as—County engineer, consulting engineer, surveyor, commission agent, purveyor of Texaco products, real estate broker, bookkeeper, blueprinter, sign painter, renting agent, Cordwood seller, and almost everything else that will help "a guy to get right in there to snare a nickel out of every four bits that rolls by, just to keep going on a get-by basis. . . ."

★ ★ ★

Swedefinition — "Sweet Adeline — The bottle hymn of the republic" P.S. to Swede Larson—I'm running out—Help! Help!!

★ ★ ★

The Diaper Line—Understand there is now a Harry A. Schlenz, who will probably join Harry E. in PFT about 1976.

★ ★ ★

Before this year is too old, and the NYSIWA Meeting in New York City is completely forgotten, here are a few memories:

FSIWA Exec. Secy. Wisely spending the late hours of Jan. 21 and the early hours of Jan. 22, polishing his next morning speech, after he had sat for five hours with the Fed. Program Committee, **after** he had sat with the 1956 Atlantic City Convention Committee for three hours, **after** he had made a presentation speech at the annual luncheon.—Busy Man!

The **first** six men who came into the hall for the morning session on Jan. 22 were the same six who had sat together until 11 pm the night before as the Federation Program committee—so they went right on from where they had left off, although it hadn't been planned at all. Accomplished something, too.

Running two full days, this year, the meeting drew more than 325 persons. Local arrangements chairman Marshall Ferguson had had the hotel reservation cancelled on him but two months before the meeting and had to scurry around; came up with the Belmont Plaza, where the only difficulty seemed to be turning on and off the lights for the slide operator.

The cocktail party, courtesy of the Wat. & Sew. Wks. Mfrs. Assn. has become an annual affair that meets with the approval of almost the entire registration.

★ ★ ★

Luminous Quote — "Water is too precious to waste, even if you get paid for it."—John H. Murdoch, Jr.

★ ★ ★

My Old Home Town(s) — In a recent issue of **The Digester,** published by the Illinois State Department of Health . I read—quote—

—Danville—While cleaning the cover on the secondary digester preparatory to painting, a number of plates were found to be so thin that holes could be easily punched in them. It was necessary to pump out the digester (this had been done two years ago) so that the plates could be cut out with a torch and new ones welded in.

—Decatur—Decatur voters have voted favorably on a bond issue which will finance construction of badly needed interceptor sewers. The vote this time was over 3 to 1 in favor of the bond issue. Voters had previously turned down the issue in light voting.—Unquote.

My first job in a water works was in Danville (there was no

(*Continued on page* 142)

How do **you** treat this maintenance headache?

What do you do when street and road surfaces fail? Patch them? Resurface? Rebuild? Actually, none of these is a permanent cure unless you *also* remove the cause of the trouble. Experience proves that in four out of five cases, the underlying cause of surface failures is excess water in the subgrade.

You can remove unwanted water once and for all with the help of Armco Perforated Pipe. Installed at the correct depth and location, a subdrain of Armco Pipe will keep the subgrade dry and stable and stop costly maintenance.

Scientifically-placed holes in the pipe admit water, yet exclude solids that would clog the line. And there's no danger of cracking or crushing. Armco Pipe has the flexible strength of corrugated metal design to assure long, trouble-free service. Coupling bands, formed to fit the pipe corrugations, keep joints tight and pipe in alignment.

Installation is quick and easy — costs are low, too. A small crew can do the job quickly with ordinary hand tools. Long, 20-foot sections mean fewer pieces to handle — fewer joints to make. Two men can readily lift, set in place, and join each section.

Write us for complete information about saving the surface with Armco Perforated Pipe. Armco Drainage & Metal Products, Inc., 2634 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO *Perforated Pipe*

Get full details of this month's products . . . mail your Readers' Service card today.

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For Better, Quicker
STREET REPAIRS

Use BARCO RAMMERS

HERE is a BETTER, QUICKER, CHEAPER way to repair streets when holes or trenches are dug in paved areas. Instead of (1) mounding up the backfill and waiting for it to settle, or (2) using expensive granular replacement fill, do as others are now doing – Use Barco Rammers to get HIGH DEGREE COMPACTION of original backfill *immediately*. No waiting to restore paving! No dangerous bumps or holes left in streets! No expensive "call backs" to work on holes! SAVE WITH BARCO!

ASK FOR DEMONSTRATION

The Barco Rammer is a new tool with many uses! Tamps backfill to 95% compaction at amazingly low cost — Let us show you actual figures. Ask for our nearest distributor to give you a demonstration.

• Send for CATALOG No. 621

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(A Chicago Suburb)
Builders of Portable Gasoline
HAMMERS and RAMMERS

UP FRONT FOR ADEQUATE ROADS

BY
LEO J. RITTER, JR.
New York University

On A Grand Scale — New York metropolitan area newspapers recently featured the announcement of a tremendous arterial-route planning study being undertaken jointly by the Port of New York Authority and the Triborough Bridge Authority. A sum of $750,000 has been allocated to this planning effort. Projects which will receive consideration include a second level (six lanes) to be added to the George Washington Bridge; a new crossing of the Hudson between 125th Street and Edgewater, N. J.; the long-dreamed-of bridge across the Narrows between Brooklyn and Staten Island; two crosstown expressways, one at about 30th Street and the other across lower Manhattan; and off-street parking facilities in the vicinity of the Hudson River crossings. Some of the planning will be done by consulting engineers, including the firms of Amman and Whitney; Edwards, Kelcy and Beck; and Andrews, Clark and Buckley.

Federal Aid—At the time this is being written it looks as though we may have to eat one of the predictions we made three months ago, i.e. "that the new federal-aid act will not provide for more than $650 million annually." Two federal-aid bills have been introduced into the federal Congress. One of these, the McGregor Bill, provides a total of $887 million per year. The other, the Case Bill, provides slightly over one billion dollars per year. Both are receiving favorable attention, with the McGregor proposal having received the blessing of President Eisenhower at a press conference early in February. It seems, at last, that the federal government is beginning to take a realistic view of the highway problem. It is almost certain, too, that the ½-cent federal excise tax on each gallon of gasoline, added as an emergency measure at the beginning of the Korean War, will not be allowed to expire, as it is scheduled to do on April 1.

Truckers—A major crisis continues to develop in the trucking industry and threatens the breakdown of reciprocity agreements between the states, by which out-of-state truckers are exempt from payment of certain highway use taxes in the states in which they operate. The crisis has arisen because of the refusal of certain states, notably Ohio and New York, to waive third structure highway use taxes on out-of-state, property-carrying vehicles. As a consequence, many states have taken retaliatory steps against truckers operating out of the offending states, particularly Ohio. A bitter, though bloodless, war is in the making, with the trucker (and the public, in the end) caught in a squeeze. We look for Governor Lausche of Ohio finally to see the light, yield to the tremendous pressures now on him, and ask for the repeal of his state's ton-mile tax, enacted last year.

Research — Two research reports of more than usual interest have come across our desk in recent weeks. One of these is Bulletin No. 133 of the Texas Engineering Experiment Station (College Station, Texas), entitled "Retention of Cover Stone by Asphalt Surface Treatments", by Fred Benson and Bob Galloway. This investigation was aimed at determining optimum quantities of aggregate and asphalt to be used in an asphaltic surface treatment. Most of the investigation was concerned with one-course (single) surface treatments. The results of this study are too detailed to be presented here. However, if you are going to do any surface treatment work this spring or summer, we suggest you take a look at this report. The other is Special Report No. 16 (Publication 289) of the Highway Research Board, 2101 Constitution Avenue, Washington 25, D. C., entitled "Mechanization

(*Continued on page* 140)

NEW Koehring 205 Truck Crane gives you lowest price per pound of lifting capacity. Its maximum 15-ton lift (on 25-ft. boom) offers a big *plus* in work capacity over other machines in the "½-yard" class. Remember, lift capacity is WORK CAPACITY. The 205's extra lift capacity increases its work capacity with all attachments. As a clamshell or dragline, it handles ½ to ¾-yard buckets on a wide work range. As a heavy-duty ½-yard shovel or hoe, its extra strength and powerful cable crowd increase production and speed of operation.

As a crawler crane, 205 has 10-ton capacity; 30 to 50-foot boom lengths. Converts to all standard excavator and crane attachments.

CHECK THESE OTHER 205 ADVANTAGES:

- **32½ m.p.h. travel speeds on rubber-tired truck mounting.**
- **Only 2 major shafts in upper machinery — simple, accessible.**
- **Big 20-inch clutches, self-adjusting.**
- **4 hook-rollers, eccentric adjustment.**
- **Antifriction power flow for dig, lift, swing, and travel.**
- **On standard or extra-long crawlers, 16, 20, or 24-inch shoes.**
- **Automatic crawler traction-brakes.**
- **Independent traction optional.**

K484 PW

Get the complete story in new 205 bulletin. Ask your Koehring distributor for your copy . . . or write us:

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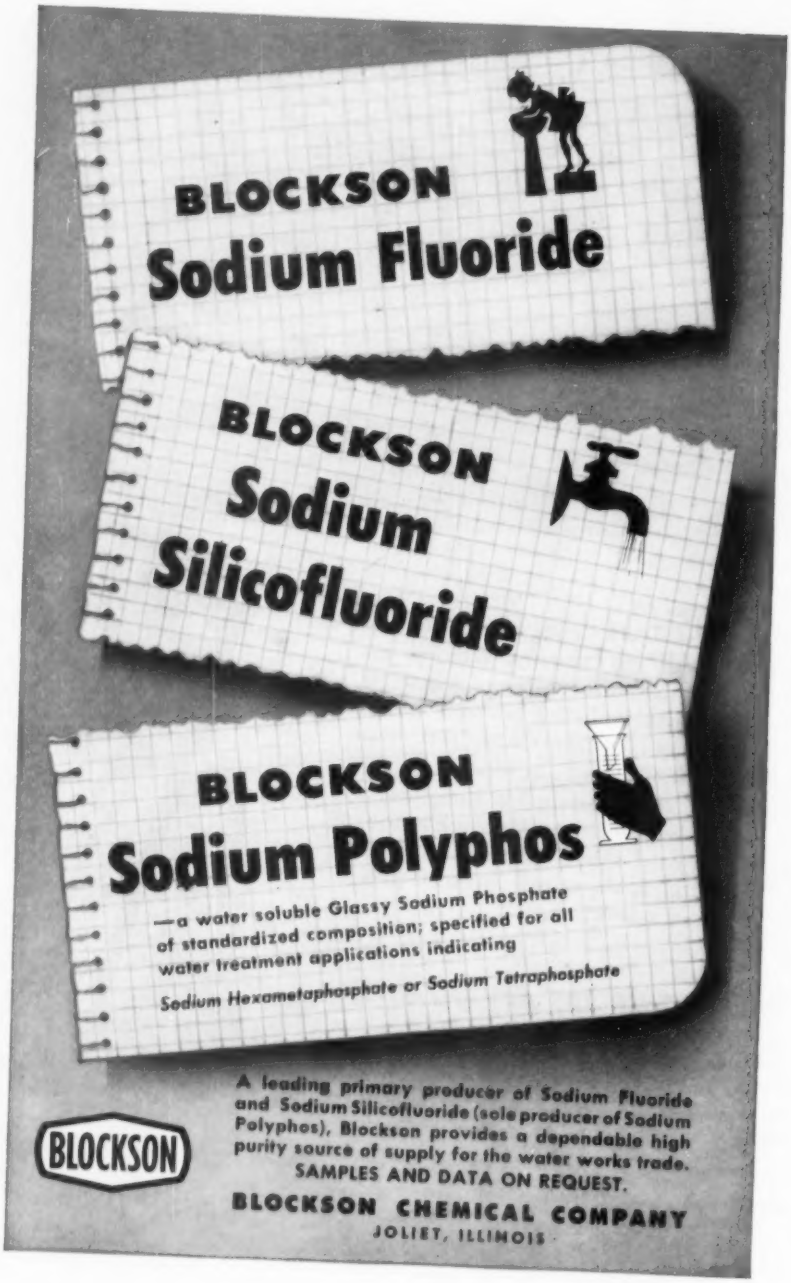
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—a water soluble Glassy Sodium Phosphate of standardized composition; specified for all water treatment applications indicating
Sodium Hexametaphosphate or Sodium Tetraphosphate
A leading primary producer of Sodium Fluoride and Sodium Silicofluoride (sole producer of Sodium Polyphos), Blockson provides a dependable high purity source of supply for the water works trade.
SAMPLES AND DATA ON REQUEST.
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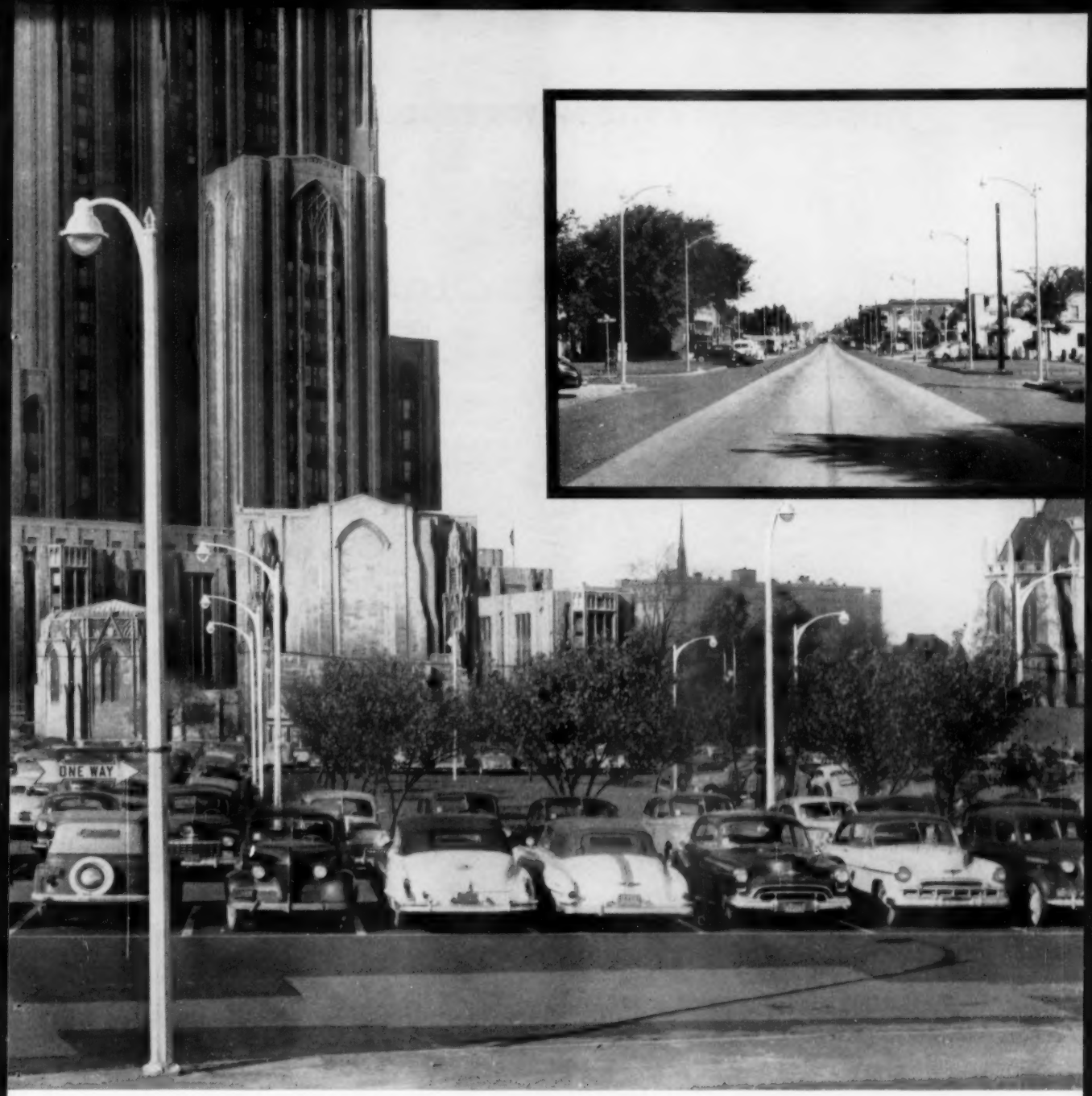

IN PITTSBURG, KANSAS, OR PITTSBURGH, PA. . . . The spelling may be different, but, big city or little city, the advantages of Monotube poles are the same —exactly the *right* designs for the requirements involved . . . for maximum lighting efficiency . . . for pleasing harmony with the surroundings.

When you specify Monotubes, you'll benefit by unmatched experience in pole engineering, design and construction. Get *all* the facts. For complete-line catalogs with pertinent data . . . for helpful planning service if you wish . . . write to The Union Metal Manufacturing Co., Canton 5, Ohio.

UNION METAL

Monotube Lighting Poles

ALLIS-CHALMERS AD-40 MOTOR GRADER GIVES YOU

Capacity

TO MOVE THE BIG LOADS

The Allis-Chalmers AD-40 Motor Grader is designed with the power, strength and performance features for BIG output in any going.

Full 104 brake hp. engine with power and speed to give maximum production on every heavy-duty grading job.

Famous ROLL-AWAY moldboard moves more material with less power output because it rolls the load.

Plenty of strength in the heavy-duty clutch, transmission and final drive backs up the big blade capacity, while the exclusive single member tubular main frame absorbs the stress of large loads.

Power steering absorbs wheel shock, helps operator keep machine "on grade" with minimum effort.

High clearance at front axle and under circle means capacity loads without interference.

ROLL-AWAY is an Allis-Chalmers trademark.

Control

FOR FINISHING TO THE BLUE TOPS

The AD-40 is outstanding in the stability and full, precise control it offers for close tolerance work.

"Pilot house" visibility lets operator see the front wheels and both ends of the blade while sitting or standing.

Operator "feel" for the close finish work comes with mechanical linkage used on the AD-40.

Smooth, easy control with hydraulic steering, faster speed selection with constant mesh transmission, positive hydraulic brakes — all help the operator do a better job.

Blade work is accurate, smooth because front-mounted lift cases eliminate long lift-arm shafts that twist or wind up under load. Tandem drive and shock-absorbing frame add to stability, help prevent blade chatter.

Full range of blade positions plus leaning front wheels permit handling all types of grading with ease.

Operator conveniences include adjustable seat and steering wheel, roomy platform, easily reached controls, full-view instrument panel.

HUGS BANKS AND STEEP GRADES

The AD-40's low center of gravity lets you grade on steep slopes. Proved engineering design keeps grader weight close to the ground . . . gives hugging ability second to none. Plenty of traction and extra stability resist side thrust . . . add to maneuverability.

Get full details of this month's products . . . mail your Readers' Service card today.

In addition to the production and control advantages the AD-40 offers, exclusive repair and maintenance accessibility features make it the easiest grader to service. Why not see your Allis-Chalmers dealer for the complete story — or better yet, let him demonstrate the AD-40 right on your own job.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

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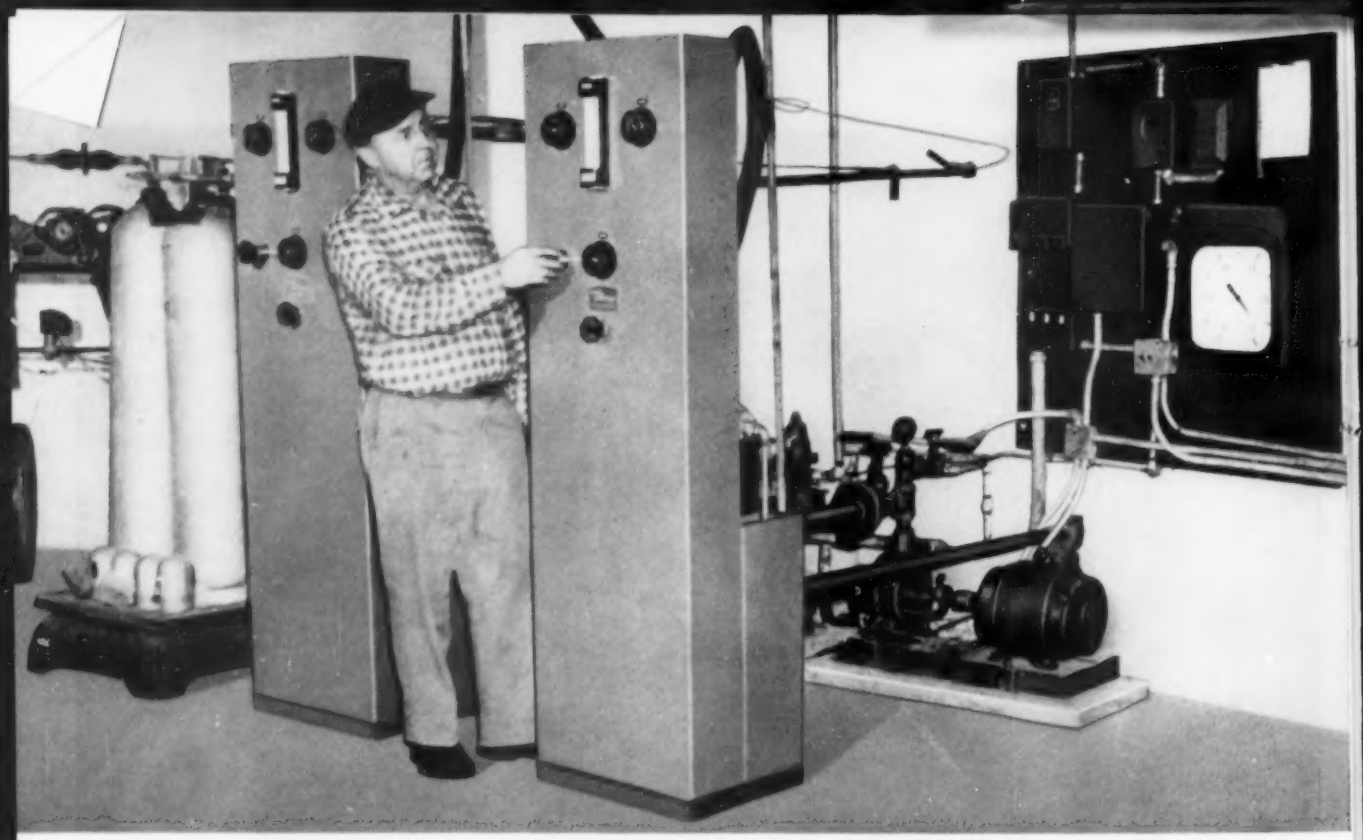

Bill Satter, chief operator, making dosage adjustment on Builders Chlorinizer.

CHLORINIZERS . . . Public Health Defenders at Grand Haven, Michigan

Grand Haven has a population of close to 10,000 people. Municipal water supply for this manufacturing, agricultural, and resort community comes from three Ranney type wells located just off the shore in Lake Michigan. Water is drawn from these wells, chlorinated by two Model DVS-A automatic-proportional Builders Chlorinizers, and is then pumped directly into the main which supplies the city.

Naturally, the State of Michigan is vitally concerned about the reliability of the equipment which handles this chlorination operation. Builders Chlorinizers were selected to defend the health of the Grand Haven people—a real tribute to the dependability and accuracy of these feeders.

Hundreds of cities throughout the country are proving that the trend is to Chlorinizer . . . for replacement, for plant expansion, for new projects. Bulletins 840-F1B, 840-J30 and 840-J8 give complete information on these modern chlorine gas feeders. **Write Builders-Providence, Inc. (Division of B-I-F Industries), 356 Harris Ave., Providence 1, Rhode Island.**

MR. R. V. TERRILL, City Mgr. says:

"The selection of Builders Chlorinizers was largely a matter of dollars and cents with us at Grand Haven. Because these feeders are so easily adapted to automatic-proportional pacing from a propeller-type meter, initial and installation costs proved considerably lower than they would have been with any other type of chlorine gas feeder. Performance of the Chlorinizers has been excellent. I checked the records the other day and found we haven't spent a cent for repairs or service since these chlorine gas feeders were installed in January 1952."

BUILDERS-PROVIDENCE

DIVISION OF B-I-F INDUSTRIES, INC.

BUILDERS IRON FOUNDRY • PROPORTIONEERS, INC. • OMEGA MACHINE CO.

METERS
FEEDERS
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U. S. BUREAU OF RECLAMATION SPECIFIES

Concrete Pressure Pipe

When the U.S. Bureau of Reclamation builds a pipeline, it must last a long, long time.

This is why the Bureau has specified concrete pressure pipe in many projects under its jurisdiction throughout the Western States. In the State of California alone, approximately 3,000,000 feet of concrete pressure pipe have been used in diameters ranging from 12″ through 84″, and for heads up to 650 feet. These jobs include the Coachella Valley Project, the Cachuma Project near Santa Barbara, both barrels of the San Diego Aqueduct, and the Central Valley Project.

Large pipe distribution systems, often calling for heads of 200 feet and over, are jobs for concrete pressure pipe. So, when your city is planning a water transmission system with either low or high heads be sure to get the facts on concrete pressure pipe.

Member companies manufacture concrete pressure pipe in accordance with nationally recognized specifications

Concrete PRESSURE Pipe

WATER FOR GENERATIONS TO COME

AMERICAN CONCRETE PRESSURE PIPE ASSOCIATION
228 North LaSalle Street
Chicago 1, Illinois

For Trouble-Free Pipe Threading ...its a 65R

RIDGID

This 65R threads
1" to 2" pipe with 1 set of dies
...and it won't jam!

You won't find a die stock to equal this popular 65R—anywhere! It saves time—one set of self-contained high-speed dies adjust to 1", 1¼", 1½" or 2" pipe or conduit in 10 seconds! Mistake-proof self-centering workholder sets to size instantly! It saves trouble—lead screw won't jam, it kicks out automatically when standard length thread is cut. Clean perfect threads, *fast!* For trouble-free extra-easy pipe threading buy 65R at your Supply House.

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RIDGID
Work-Saver Pipe Tools

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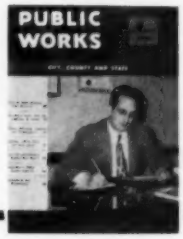
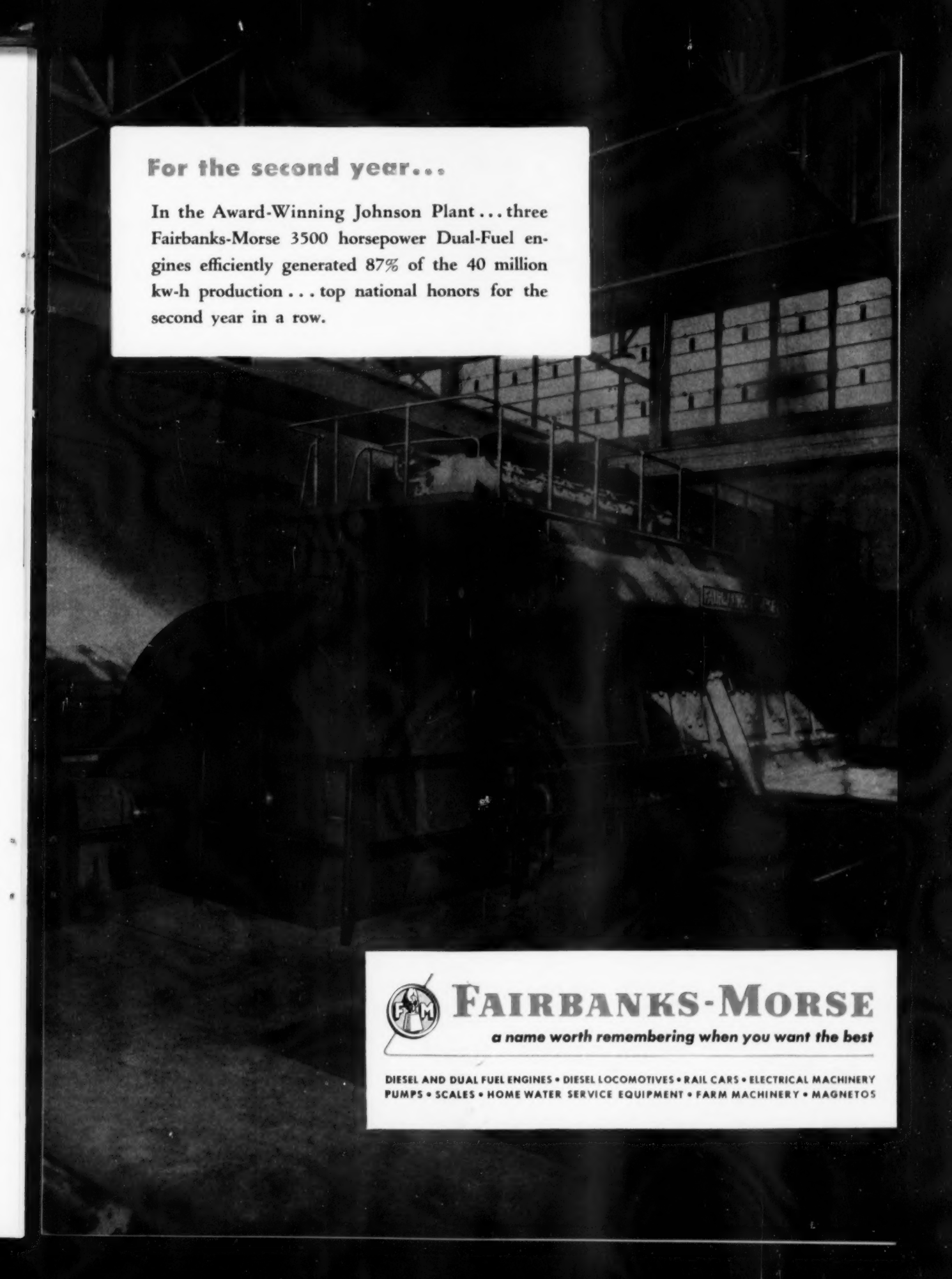


LEADERS IN THE PUBLIC WORKS FIELD

★

Robert L. Lippman has been City Engineer of Hammond, Ind., since May, 1952, during which time he has many problems. One of these was the solution of subdivision sewerage and paving tangles and curing the headaches resulting from them. What he did was described in February PUBLIC WORKS (page 74), but he writes us he has had so many requests for the regulations and procedures that he cannot answer them all; so please don't ask for any more.

Graduated from Purdue in Feb., 1943, he managed to sandwich this in between ordnance plant construction and service as an officer in the FA of the Army, which latter lasted three and a half years. His work in Hammond includes supervision and advice on street and sewer department activities, maintenance of public buildings, and advice to the mayor and council on traffic flow, islands, intersections and street lighting. He is on a number of boards including City Plan, Public Works and Safety, Sanitary, and Electrical Examiners. He is a member of NSPE, APWA and Indiana City Engineers' Ass'n. He has also worked on the effects of atomic explosions on buildings and structures. Hobbies include city planning, municipal public works, architecture and structural engineering, and he says he doesn't have time for anything else, which seems natural. He is married and he and Mrs. Lippman have one daughter.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In the Award-Winning Johnson Plant ... three Fairbanks-Morse 3500 horsepower Dual-Fuel engines efficiently generated 87% of the 40 million kw-h production ... top national honors for the second year in a row.
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Maintained Accuracy...over wide capacity range
Accuracy not affected by pulsations, pressures or other variables
Compact design... to save space and foundation costs
Long-time reliability with little maintenance

CHECK THE "BIG 4"

ESSENTIALS FOR METER PERFORMANCE

The basic accuracy of Roots-Connersville Positive Displacement Meters stems from their simple design, with no valves, vanes or other small parts. And, because there is nothing to wear out, this accuracy is maintained for many years—with little maintenance or other supervision.

Where space is a factor, the compactness of R-C units is important. Capacity of 1,000,000 cfh, for instance, requires only 98 feet of floor area. Small meters can be tucked away in otherwise unusable space. Short-time overloads up to 50% of capacity can be handled without loss of accuracy.

These outstanding values in R-C Meters come from a century of building equipment to handle gas or air, and have been long proved in large and small installations for industry and public utilities.

For detailed information, ask for Bulletin M-152, which also contains a handy selection table to simplify selection of size and type required.

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Specialists in handling gas and air

Thousands use our Readers' Service card to keep up to date . . . do you?

BOOKS IN BRIEF

ROADSIDE DEVELOPMENT PROCEEDINGS

The proceedings of the 1953 meeting of the Roadside Development Committee of the Highway Research Committee of the Highway Research Board have been issued as Publication 286. Nine different subjects are covered ranging from "How to Start Grass Growing" to "How to Keep Grass from Growing Too Long." New machinery is reviewed and illustrated. This 90-page, paper covered, letter size book is available from the Highway Research Board, 2101 Constitution Ave., Washington 25, D.C. for $1.35 a copy.

HYDRAULIC TABLES

"Hydraulic Tables," a pocket-size handbook prepared under direction of the Chief of Engineers, U. S. Army, has been reprinted by the Government Printing Office, where it is now available at $2.50 a copy. This 565-page handbook contains 46 tables which are helpful in solving the Manning Formula for flow in open channels. Some of the tables are extensions of tables in King's "Handbook of Hydraulics," and in the Bureau of Reclamation's "Hydraulic and Excavation Tables." Some are new tables.

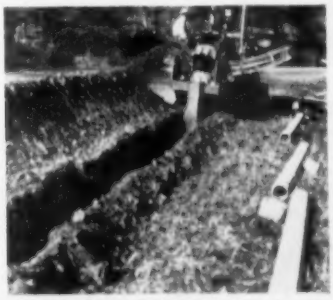
HIGHWAY STATISTICS FOR 1952

This is the eighth of the bulletin series prepared by the Bureau of Public Roads presenting annual statistical and analytical tables on the subjects of motor fuel, motor vehicles, highway user taxation, financing of highways, and highway mileage. The 142-page, paper bound, book may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for 75 cents a copy.

REPORT ON CULVERT HYDRAULICS

Research Report 15-B of the Highway Research Board describes some of the common causes of inefficient hydraulic performance of culverts and presents results of recent investigations into the possibilities for improvements through better design. The usual square-edged entrance may cause the culvert to flow only partly full even with an appreciable head over the top of the barrel. New designs re-

Save time and money on water line installation



In this Georgia installation, faster line assembly permitted following the digger closely.

On this Utah job, snow, ice and frozen ground caused no installation slow-down.

In this California installation, flexible Ring-Tite joints permitted conformance to curves.

Transite® Pressure Pipe with the new Ring-Tite® Coupling

Goes together fast! Locks tight automatically!

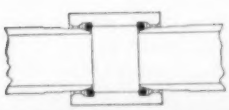
In state after state, community after community, water district after water district, Transite Pressure Pipe and the new Ring-Tite Coupling have made possible important cost-savings in installation time.

The Ring-Tite Coupling is effecting installation savings everywhere because of its special features. To begin with, pipes are aligned quickly, easily. Coupling design not only provides automatic aligning but also automatic adjustment for expansion. Rubber rings are simply popped into grooves for assembly; lubricated pipe ends then slide in under rings smoothly, easily, and surely.

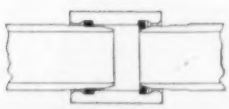
Pipe ends are automatically separated within the coupling. This separation gives the line flexibility to withstand shock and vibration, relieves line stresses, permits conformance to curves.

Like Transite Pressure Pipe, the Ring-Tite Coupling sleeve is made of asbestos and cement . . . it is strong and durable, cannot rust, and is highly resistant to corrosion. Installations can be completed under adverse weather, temperature or terrain conditions. No complicated equipment is required.

For more information write Johns-Manville, Box 60, New York 16, N. Y.



A. Rubber rings popped into grooves before assembly.



B. Lubricated pipe slides in under rubber rings.

C. Both pipes in assembled position. Rings compressed and locked in place.

Johns-Manville TRANSITE PRESSURE PIPE
AN ASBESTOS-CEMENT PRODUCT

Now's the time to mail this month's Reader's Service card.

"THE PIGMENT IS THE LIFE OF THIS PAINT"

The Flake SILICA-GRAPHITE in this paint

helps cut maintenance costs,
increases paint life

because... Dixon Flake Silica-Graphite

gives higher chemical resistance — the Flake Silica-Graphite pigment is *chemically inert*, unaffected by acids, alkalies, sunlight, or corrosive industrial fumes.

and... Dixon Flake Silica-Graphite

has higher water repellency — layer on layer pigment structure resists moisture penetration.
has greater film flexibility — an inherent lubricant quality retains film flexibility longer.

Cut maintenance paint costs up to 50%

Get the whole money-saving story in FREE Bulletin #V-60 which includes 17 actual paint chips... complete technical and application data.

Paint Products Division
JOSEPH DIXON CRUCIBLE COMPANY
170 Wayne Street, Jersey City 3, N. J.

Yes! I'd like to cut maintenance paint costs up to 50%. Rush Bulletin #V-60.

NAME _____ TITLE _____
COMPANY _____
STREET AND NUMBER _____
CITY _____ ZONE _____ STATE _____

It's a fact... our handy Readers' Service card is the way to get new catalogs.

duce or correct this condition. This 72-page, paper bound, booklet is available from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C., at a cost of $1.05.

TRICKLING FILTER DESIGN

An excellent small book of nomograms for the design of trickling filters covers (a) population, BOD and flow relationships; (b) circular clarifier design (c) trickling filter design; (d) capacity of cylindrical tanks; (e) volume of concrete in circular walls; (f) volume of concrete in circular floors; and various other information. Page size is 8½ x 11; 19 pages. $5 from L. E. Livingston & Son, 3921 Purdue St., Dallas 5, Texas.

ENGINEERING APPLICATIONS OF SOIL INVESTIGATIONS

Bulletin No. 83 of the Highway Research Board gives several examples of the way soil surveying and mapping has been used. Experience of Michigan, Kansas, North Carolina, New Jersey and Wyoming State Highway Departments is given. Progress of Geologic Survey mapping and Soil Conservation Service surveys is included. 74 pages, paper covered, $1.05 from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

HIGHWAY PROBLEMS OF RIGHT-OF-WAY

Bulletin 77 of the Highway Research Board brings together the latest committee project reports, digests of new laws, judicial decisions and administrative regulations, in the field of land acquisition and control of highway acres and adjacent areas. 72 pages, paper bound, available from Highway Research Board, 2101 Constitution Ave., Washington, D. C.

CALIFORNIA STREET AND HIGHWAY CONFERENCE

Various phases of highway work were discussed at the conference under the headings—Planning and Administration; Cnnstruction and Maintenance; Traffic; Education and Research; and Urban Transportation. The proceedings are lithographed, illustrated, 115 pages 8½ x 11, paper bound and are for sale by the University Press, Berkeley 4, California, at $2.00.

GREATER OUTPUT LOWER UPKEEP WITH NEW TORQUE CONVERTER DRIVE

New standards of tractor-shovel performance are being set by the famous 1½ yd. Model HM "PAYLOADER" because a NEW Torque Converter drive has been added to its many features. A year of extensive field-testing proves that this new development insures faster, lower-cost materials handling because output is increased up to 1/3 and maintenance is drastically reduced.

Combined with the 4-speed, full-reversing transmission, the Torque Converter provides an unlimited range of automatically selected speeds to meet the load and operating conditions. Parts breakage and maintenance are less because shock loads are absorbed.

TORQUE CONVERTER DRIVE

MORE EFFICIENCY — Engine operates at most efficient speeds — no laboring or stalling

LOWER MAINTENANCE — Oil cushion absorbs load shocks—protects vital parts

EASIER OPERATION — Eliminates much gear-shifting and "clutching"

GREATER OUTPUT — Machine operates at highest speed in relation to load

Prove to yourself that this pioneer four-wheel-drive tractor-shovel, with torque converter, is the finest tractor-shovel available. Ask your "PAYLOADER" Distributor for a demonstration, or write The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Illinois.

YOU CAN'T COMPETE IF YOUR EQUIPMENT IS OBSOLETE

SAY "HUFF"

PAYLOADER®

THE FRANK G. HOUGH CO. • Since 1920

Write for ... details on the big 1½ yd. Model HM, or on any of the six smaller "PAYLOADERS" — 1½ yd., 1 yd., ¾ yd., ½ yd. or 12 cu. ft. sizes.

Get full details of this month's products . . . mail your Readers' Service card today.

Traffic-stopper . . . sales-builder! This 100 x 160-foot Butler building gives the Shult Implement Company, El Campo, Texas, a sales "showcase" with permanent, low-cost space for displays, offices, parts and service departments.

This main street beauty is a "showcase" BUTLER steel building

Traffic slows as drivers take a second look. Folks on foot pause to browse and stay to buy. The cash registers never seem to stop "talking." Yes, the eye-catching beauty of this modern store—that's a Butler steel building at heart—does more than tickle the owner's vanity. It actually increases store traffic—sales and profits!

You, too, can profit by doing business in a building that's an attractive "showcase" for your merchandise. You don't have to be made of money, either. You can get costly custom-built beauty at mass production prices by combining a regular Butler building with wood, masonry, and glass. Your architect can economically create the individuality that coaxes more customers inside.

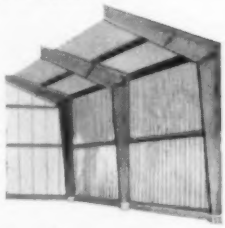
Butler buildings provide post-free interiors for shops, stores or offices that are 100 per cent usable. They can be economically heated—insulated for year-around comfort. Insurance rates are low.

You don't need a big bankroll to own a beautiful shop or store, tailored to your individual needs. Write today for full details and the name of your nearby Butler dealer!

Here is why BUTLER is a better buy

Every Foot of Floor Space is Usable

There are no interior posts or columns to waste space and create work-slowing "bottlenecks." Rigid-frame construction also shrinks maintenance costs . . . extends building life.



Fast Erection . . . Easy Expansion

Precision-punched and dimensioned bolt holes speed erection—simplify expansion or dismantling and moving. Galvanized bolts, with Neoprene rubber washers, lock deep-corrugated sheets firmly to the sturdy frame.

Weatherproof Protection

The one-piece, die-formed roof ridge eliminates ridge roll—helps to make the building leakproof and weather-tight.

Triple-Strength Corrugated Sheets

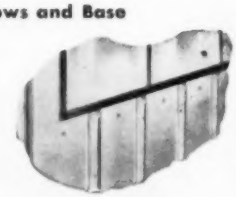
Butler sheeting with deep-formed corrugations on 12-inch centers, is three times as strong as ordinary corrugated sheets. Overlapping corrugations bolt tightly together for maximum strength and weather protection. Your choice of steel or aluminum sheeting.

Attractive Curved Eaves

The neat, die-formed eaves—which bolt to the roof sheets—add to the appearance of Butler steel buildings...increase the strength of the eaves . . . help insure weather-tightness.

Weather-sealed Windows and Base

Where corrugated sheets meet windows or the foundation, they are tightly crimped for a snug fit that keeps out snow, moisture and rodents.



BUTLER STEEL PRODUCTS

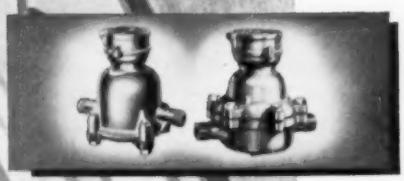
BUTLER MANUFACTURING COMPANY

7321 East 13th Street, Kansas City 26, Missouri
921A Sixth Avenue, S. E., Minneapolis 14, Minnesota
1021 Avenue W, Ensley, Birmingham 8, Alabama
Dept. 21A, Richmond, California

Manufacturers of Oil Equipment • Steel Buildings • Farm Equipment • Cleaners Equipment • Special Products

Factories located at Kansas City, Mo. • Birmingham, Ala. • Richmond, Calif. • Galesburg, Ill. • Minneapolis, Minn.

WATER is vital...



BADGER meters conserve it!

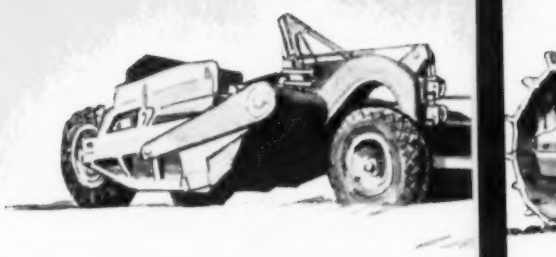
America now uses more than 7 *billion gallons* of water per day . . . making conservation of supply almost as vital as the water itself. That's one reason Badger meters are used in thousands of communities throughout the nation. Badger meters measure water precisely . . . are made for every kind of water measuring job . . . provide an accurate check of water usage and water waste. And the Badger meter record of performance is unsurpassed . . . has caused waterworks men everywhere to agree — "It pays to install Badger meters!"

BADGER WATER METERS

BADGER METER MFG. CO., Milwaukee 45, Wisconsin

"Measuring the water of the world"

Announcing a $10,000 guarantee on used equipment!



Your Caterpillar Dealer now offers you a "BONDED BUY" on used Caterpillar-built equipment backed by a bond of $10,000. This bond is issued by The Travelers Indemnity Company. Your dealer *gives* you this protection when you purchase a "BONDED BUY" machine.

This is the *first* time in the heavy-duty machinery field that such an offer has ever been made!

And that's not all. You are also offered two other classes of used equipment buys—"Certified Buy" and "Buy and Try." These cover used equipment of *any* make.

What does this mean to you? First of all, *it takes the guess and gamble out of buying used equipment.* You know what you're getting. And your assurance is in writing!

What's more, *no matter what your needs, cost-wise or work-wise,* you have a *choice* of used equipment to meet them.

Only your *Caterpillar Dealer* offers you this across-the-board selection—"Bonded Buy," "Certified Buy" and "Buy and Try" used equipment. The best source of new machines, he's also your best source of used machines—tractors, engines, motor graders and earthmoving units.

Whether you're in the market for one machine, a few or many, he's the man to see for your *best* buy. See him today for complete details on guaranteed used machines!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

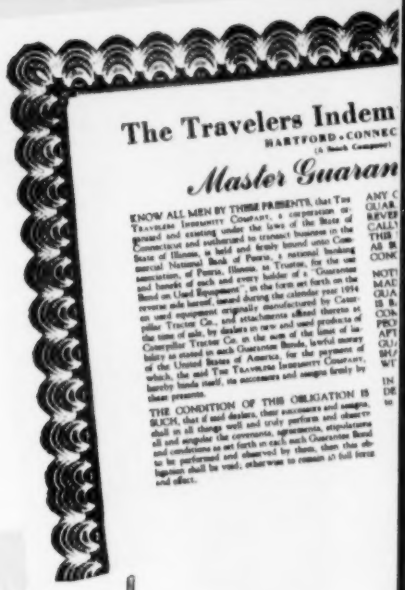
REG. U. S. PAT. OFF.

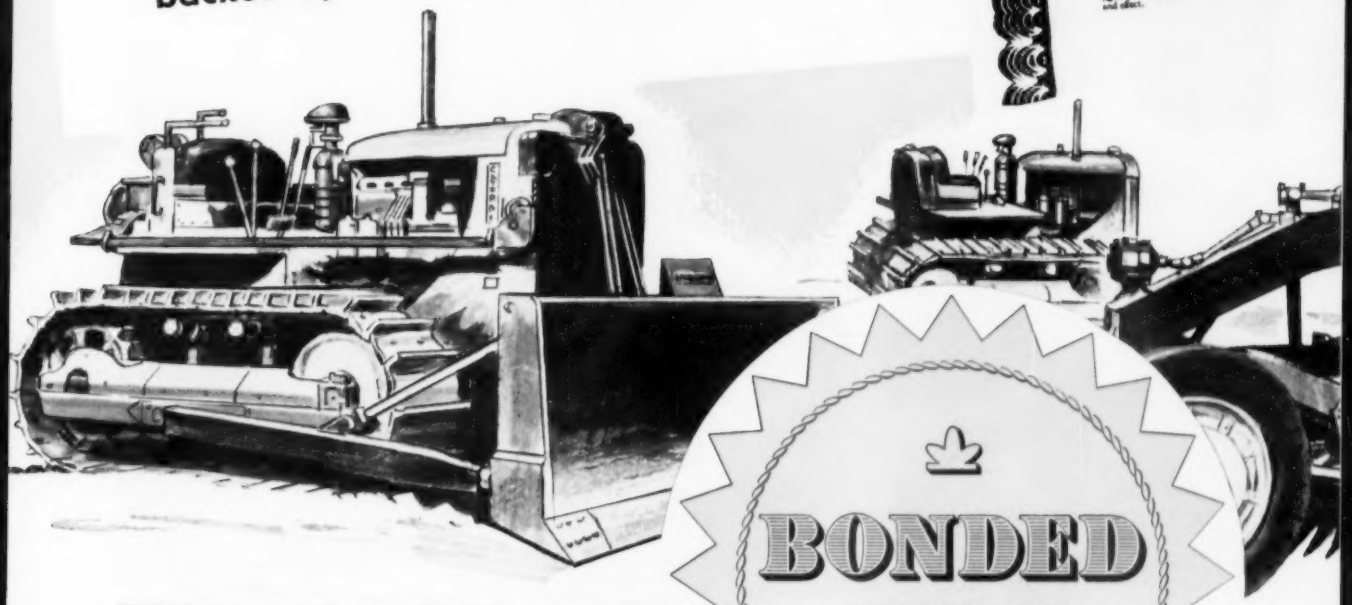
DIESEL ENGINES • TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

BEST BUYS IN NEW AND USED EQUIPMENT

Never before a guarantee like this!

Only your CATERPILLAR DEALER offers a "BONDED BUY" on used Caterpillar-built equipment backed by a bond of $10,000.


The Travelers Indem
HARTFORD • CONNEC
Master Guaran
KNOW ALL MEN BY THESE PRESENTS, that The Travelers Indemnity Company, a corporation organized and existing under the laws of the State of Connecticut and authorized to transact business in the State of Illinois, is held and firmly bound unto Commercial National Bank of Peoria, a national banking association, of Peoria, Illinois, as Trustee, for the use and benefit of each and every holder of a Guarantee Bond on Used Equipment, in the form set forth on the reverse side hereof, issued during the calendar year 1954 on used equipment originally manufactured by Caterpillar Tractor Co., and attachments offered thereto at the time of sale, by dealers in new and used products of Caterpillar Tractor Co. in the sum of the limit of liability as stated in such Guarantee Bonds, lawful money of the United States of America, for the payment of which, the said The Travelers Indemnity Company, hereby binds itself, its successors and assigns firmly by these presents.
THE CONDITION OF THIS OBLIGATION IS SUCH, that if said dealers, their successors and assigns, shall in all things well and truly perform and observe all and singular the covenants, agreements, stipulations and conditions as set forth in each such Guarantee Bond to be performed and observed by them, then this obligation shall be void; otherwise to remain in full force and effect.



BONDED BUY

DON'T GUESS OR GAMBLE ON USED EQUIPMENT!

You KNOW what you're getting at your CATERPILLAR DEALER

Your Caterpillar Dealer offers you three clear-cut classes of used equipment. He backs each one in writing. You buy with confidence, sure that the equipment is honestly described. See him for the best used values on the market:

(1) **"BONDED BUY."** Only the best in used Caterpillar-built equipment. Each "BONDED BUY" machine is backed by a Dealer's Guarantee Bond equal to the purchase price of the machine up to a maximum of $10,000. This provides a guarantee for thirty days against unsatisfactory performance due to defective parts. If a part should prove defective within the guarantee period under the normal conditions of your job and with proper maintenance, your dealer will put your machine back into operating condition *with no charge to you for parts and labor* up to the amount of the bond. The Dealer's Guarantee Bond is backed by The Travelers Indemnity Company. Your Caterpillar Dealer gives you this protection with your purchase of a "BONDED BUY" machine. Look for the "BONDED BUY" symbol —it's your assurance of the best in used equipment.

(2) **"CERTIFIED BUY."** Next best buy in used equipment: "Certified Buy" covers machines of any make in good condition. Your performance guarantee is in writing backed by your Caterpillar Dealer.

(3) **"BUY AND TRY."** Bargains in used machines of any make. Buy and try them for a period mutually agreed upon by you and your Caterpillar Dealer. Each "Buy and Try" machine carries his written "money-back" agreement.

"BONDED BUY" *assurance effective in the United States*

Copyright 1954, Caterpillar Tractor Co.

EASY ALIGNMENT!

Pipe deflections—resulting from varying flange thicknesses and restricted bolt play—presented no problem to engineers designing Cleveland's 22 million dollar Nottingham Filtration Plant. In joining cone valves to a 36″ wash water line, for example, they specified Dresser Couplings which permit up to 3° deflection, yet maintain watertight joints.

In addition, Dresser Couplings provide easy entrance into the line, simplify maintaining and replacing the valves.

For information on Dresser Coupling applications that may suggest new solutions to old problems—help you get a *superior* job on water, sewage and industrial waste projects—contact your local piping supply house or write us.

DRESSER® COUPLINGS

Dresser Manufacturing Division, 69 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales offices also in: New York, Philadelphia, Chicago, Toronto.

Need more facts about advertised products? Mail your Readers' Service card now.

THE NEW BARBER-GREENE *Mixall* MEETS THE NEED FOR ALL MAINTENANCE AND SMALL PAVING JOBS

The quotation at the top of this page is typical of impartial observers who have seen the new Barber-Greene MIXALL perform. There is widespread agreement among editors, road builders and government officials that the need for a machine capable of on-the-spot production of even the highest type hot mixes has been answered by the development of the MIXALL.

Primarily designed for "stitch in time" maintenance to prevent major break-ups of much needed roads, the MIXALL also opens the market for surfacing of sidewalks, driveways, parking lots, service stations, playgrounds and countless others.

Once you see the MIXALL perform, you'll quickly recognize the business-building possibilities it holds for you. See your Barber-Greene Distributor for the full story—or write for information.

Barber-Greene BG

Aurora, Illinois, U. S. A.

Get full details of this month's products . . . mail your Readers' Service card today.

THE LATEST DEVELOPMENTS IN HIGHWAY AND AIRPORT FORMS

● All paving forms should perform two distinct functions. First, they should accurately confine the limits of the pour, and, secondly, they must act as track, supporting and steering the massive machinery required to prepare the subgrade, spread, finish and cure the slab.

● The ability of Heltzel Forms to best fulfill these two basic functions is the big reason why they are preferred by leading contractors everywhere. For behind the Heltzel name is almost half-a-century leadership in the design and manufacture of steel forms. This "know-how"—has enabled Heltzel to constantly produce practical, workable, "form setter's" forms that set fast, align perfectly, hold steady and firm. And "Heltzel Built" means they're precision fabricated of special analysis carbon-manganese steel, pre-stressed to withstand heaviest loads without failure.

● The form illustrated above is the latest design of the popular HELTZEL DUAL-DUTY FORM. (Two forms in one for two different slab thicknesses.) It features extra-wide, two-way stake pockets and restyled end supports which add up to the strongest form in the field. The triple-prong slide locking arrangement and single direction wedging gives form setters perfect alignment with a minimum of effort.

● This long experience and constant experimentation make it just common sense to see the Heltzel representative in your area before you purchase form equipment. If you don't already have a complete file of Heltzel Form literature, use the coupon below.

HELTZEL

STEEL FORMS

Please send latest form literature to:

Name_____

Company_____

City_____ State_____

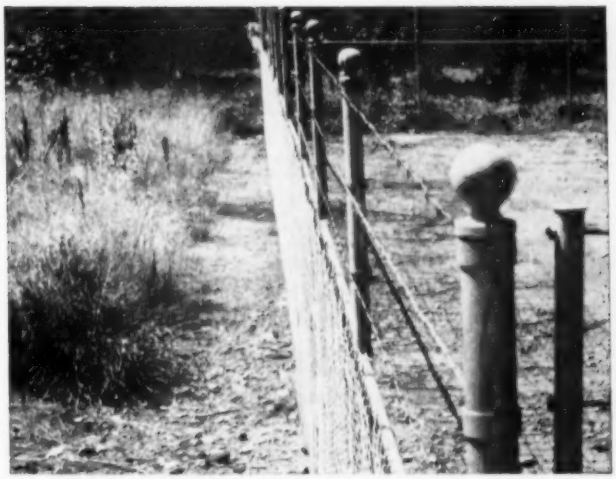
THE HELTZEL STEEL FORM AND IRON COMPANY • 4100 THOMAS ROAD • WARREN, OHIO

Thousands use our Readers' Service card to keep up to date . . . do you?

Have you compared costs of weed control lately?

It's economical
because it's simple
and long-lasting
when you use

Du Pont "Telvar" W
Weed Killer



Area under fence has been treated with "Telvar" W—the easy, low-cost way to keep key areas clear of unwanted vegetation. Weeds on the left show type of vegetation involved.

One spraying of as little as 40 to 60 pounds of Du Pont "Telvar" W per acre can get rid of vegetation *for a growing season or longer!* This powerful weed killer kills through the roots . . . remains in the ground to prevent new growth. Its lasting chemical action is just what's needed around power plants, substations, pole yards, storage yards, fencerows, etc.

Savings for You

With "Telvar" W on the job, you'll save labor and maintenance costs. A single spraying takes the place of laborious cutting and mowing . . . expensive multiple spraying. You eliminate the problem of storing and handling bulky weed killers, too. It all adds up to new efficiency in weed control—new economy in keeping key areas neat and trim.

Easy and Safe to Use

"Telvar" W is a wettable powder that mixes readily with water and is low in toxicity to humans and animals. Non-volatile, non-flammable and non-corrosive, it can easily be applied by standard spraying equipment.

Your Custom Sprayer Can Help

Specify "Telvar" W for this year's weed-control program. If you don't have spraying equipment, get in touch with a reliable custom sprayer to do your weed killing on an annual basis.

For more information about Du Pont "Telvar" W, clip and mail the coupon to E. I. du Pont de Nemours & Co. (Inc.), Grasselli Chemicals Department, Wilmington 98, Delaware.

Mail This Coupon
for Free Booklet

E. I. du Pont de Nemours & Co. (Inc.)
Grasselli Chemicals Department, Rm. D-4026
Wilmington 98, Delaware

☐ Please send me your booklet describing positive weed control with "Telvar" W. ☐ Send me the name of my nearest supplier.

Name_____ Position_____

Firm_____

Address_____

City_____ State_____

DU PONT TELVAR W
REG. U.S. PAT. OFF. TRADE-MARK
Weed Killer

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

On all chemicals always follow directions for application. Where warning or caution statements on use of the product are given, read them carefully.

Now's the time to mail this month's Reader's Service card.

FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

How to Compute Fluoridation Dosages

358. A convenient nomogram applicable to all flows and all fluoride dosages has been prepared by B-I-F Industries, Inc., 345 Harris Ave., Providence 1, R. I. Check coupon for copy of Keep Sheet No. 24.

How the "Payloader" Helps Public Officials

190. An attractive new booklet "Getting More for the Tax Dollar with Payloaders" makes worthwhile reading for every public official in charge of construction and maintenance of roads, streets, and utilities. You will find illustrations and data showing dozens of ways the "Payloader" is used by cities, counties and states, plus convenient specifications on seven models. Check the coupon or write Frank G. Hough Co., 761 Seventh St., Libertyville, Ill.

Safe-T-Cones Solve Traffic Problems Night and Day

222. For data on Safe-T-Cones, the all-rubber traffic guides available in two sizes, 18" and 28"—painted or reflectorized for day and nighttime use—get bulletin from Radiator Specialty Co., Charlotte, N. C. Information included on Safe-T-Signs which add greatly to value of markers. Check the coupon now!

Data Offered on Ford "Kornerhorn"

195. For basement meter settings, the Ford Meterbox Co., Inc., Wabash, Ind. now offers the Kornerhorn which gives all the benefits of the successful Copperhorn and in addition eliminates pipe threading and may be fit into tight corners. May be used with one or two valves. For specifications and pictures of step-by-step installation get bulletin by checking the coupon.

Investigate These Street Lighting Standards

366. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards by using the handy coupon. Check these strong, well designed, yet inexpensive steel standards for practical street and highway lighting. Handsome folder also includes data sheets on floodlighting and area lighting standards. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Helpful Data on Street Flushers

167 A comprehensive 6-page bulletin covering a full line of street flushing and cleaning equipment is offered by Roscoe Mfg. Co., Minneapolis, Minn. A wide variety of units are illustrated and information is given on many features. For your copy just check the handy coupon.

A-B-C's of Turbine and Generator Operation

204. A handsome 20-page booklet that shows the workings of steam turbines and generators suitable for municipal power production has been issued by the Worthington Corp., Harrison, N. J. Written especially for the city official, this booklet shows how carefully engineered modern equipment meets requirements for a dependable power source. Check the coupon for your copy.

Helpful Data on Swimming Pools

364. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg Co., Michigan City, Ind. Check coupon for your copy.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the coupon.

How to Make Your Own Photocopies

354. Get full information on the easy way to make photocopies of plans, specifications, office forms and data sheets. A complete photocopy information kit available from American Photocopy Equipment Co., 1919 W. Peterson St., Chicago 26, Ill. includes several bulletins which give the answer to all your copying problems. Just check the coupon for this material.

Helpful Data on Street Name Sign Construction

355. Information on the construction of street name signs, including permanence of legibility, finishes, reflectorization, durability and many other factors which must be considered by buyers of street signs is presented in a new folder issued by Municipal Street Sign Co., 777 Meeker Ave., Brooklyn 22, N. Y. Get your copy of this helpful report by checking the coupon.

Have You Investigated Surveying Altimeters?

356. Great savings in time, manpower and equipment are available through the use of surveying altimeters which determine elevations in a small fraction of the time required by all other methods. Precision altimeters, with dials graduated as close as one foot intervals, are fully described in a handsome new bulletin issued by American Paulin System, 1524 S. Flower St., Los Angeles, Calif. Just check the coupon for full data.

Aggregate Spreaders— A Full Line for Every Need

357. Bulletins published by the Burch Corp., Crestline, Ohio, cover a full line of spreaders for all types of aggregate materials. Units include the Uni-Flow spreader which features accurate spread control operated by positive direct drive from truck power; force feed and gravity spreaders; many models for tailgate and trailer mounting. Check the coupon for latest data.

4-54

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

STOP READ AND SEND

Booklets from pages 38 to 56:

20 23 25 26 27 28 29 31 33 34
36 40 43 44 45 48 49 52 59 66
72 81 86 92 93 97 99 100 108 109
110 112 115 116 117 120 124 126 132 140
141 143 148 157 162 165 167 173 174 175
176 177 180 185 187 190 195 197 200 203
204 206 207 211 220 222 224 232 237 239
240 246 248 249 261 263 268 273 274 277
278 287 288 291 303 304 311 315 317 330
332 333 338 343 347 348 349 350 351 354
355 356 357 358 359 360 361 362 364 365
366 367 368 369 370 371 372 373 374 375

New Products, pages 145 to 148:

4-1 4-2 4-3 4-4 4-5 4-6 4-7 4-8 4-9 4-10
4-11 4-12 4-13

Name .....

Occupation .....

Street .....

City ..... State .....

NOT GOOD AFTER MAY 15, 1954 MAIL THIS CARD NOW

Efficient Landfill Operations For Small Communities

349. Step-by-step photos and concise text are used in a bulletin of the Oliver Corp., to show the construction and operation of a sanitary landfill, using equipment especially suitable for the smaller community, the Oliver OC-3 Tractor-Loader. Besides providing economical refuse disposal, many other jobs handled by this unit are suggested. For a copy, write to the Oliver Corp., 400 W. Madison St., Chicago 6, Ill. or check the coupon.

Operations Manual Tells Brush And Weed Control Techniques

360. Data on methods and results in chemical brush and weed control are outlined in an operations manual compiled by the Du Pont Company. Included are cost data and evaluations of short-term vs. long-range control programs. Copies of this illustrated manual may be obtained from Grasselli Chemicals Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., or by using coupon.

How to Plan Your Playgrounds

26. A 40-page booklet offered by J. E. Burke Playground Equipment Co., Box 986, New Brunswick, N. J. provides a valuable guide for selection of equipment, playground planning, safety considerations and equipment assembly and maintenance. Full data on space requirements and suggested layouts are included. Check the coupon for a copy.

MORE LISTINGS ON PAGES 40 TO 56

Instant Communications By Two-Way Radio

359. A new 8-page illustrated booklet, published by General Electric Co., Electronics Park, Syracuse, N. Y., discusses the use of two-way radio for better coordination of men, materials and machines. A wide variety of applications for maintenance and emergency services are considered. Check the coupon now to get attractive bulletin.

Three-Stage Reactors for Turbidity and Hardness Removal

66. A new bulletin issued by American Water Softener Co., 4th & Lehigh Ave., Philadelphia 33, Pa. gives information on the "American Reactor" for removal of hardness, suspended solids, turbidity, color, taste and odors. This unit embodies three stages for initial precipitation, coagulation and hydraulic separation; is circular in cross section; and may be constructed of either steel or concrete. Get Bulletin No. 500 by checking the coupon.

"Ring-Tite" Joints for Fast Valve Installation

140. Rensselaer valves and hydrants are now furnished with Ring-Tite ends for quick and simple installation with Transite pipe. Gate valves are available in sizes 4" through 12" for Class 150 Transite pipe; 4" and 5" fire hydrants for connection with 4", 6" and 8" pipe. Get Bulletin M-1 from Rensselaer Valve Co., Troy, N. Y., by checking the coupon.

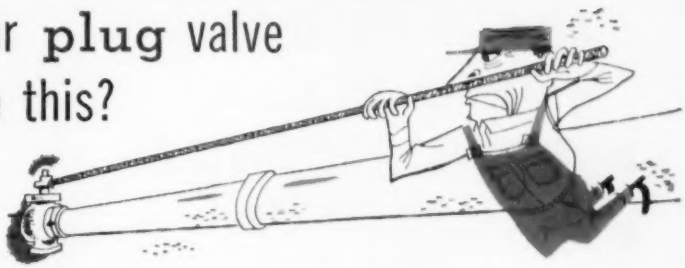
Engineering Data on Equipment for Municipal Water Conditioning

347. For information on the design and operation of many types of water treatment plant equipment, including the Graver Reactivator, pressure filters, iron removal installations, zeolite softening and water conditioning for swimming pools get Bulletin WC-113 from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Check the coupon.

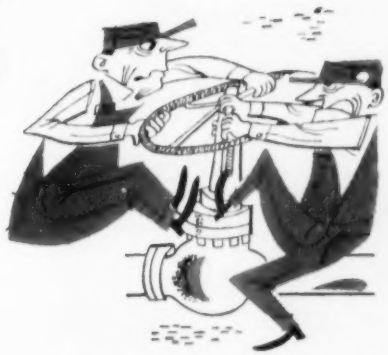
Cities Report Salt Use For Snow and Ice Control

365. The experiences of street and highway superintendents in the use of salt for snow and ice control are described in a series of reports which have been collected and reprinted in a 43-page book by the Cayuga Rock Salt Co., Myers, N. Y. Be sure to get your copy of "Lower Cost Highway Ice Protection." Just check the coupon. It's interesting and informative.

Do you have to operate your **plug** valve like this?



Or do you have to use **two** men to operate your **gate** valve like this?



Then install the **G-A ★ FLOWTROL VALVE** which can be operated like this

★ *Save the price of an elbow fitting with the angle body design.*

FULL TECHNICAL FACTS SENT ON REQUEST

Write Today!

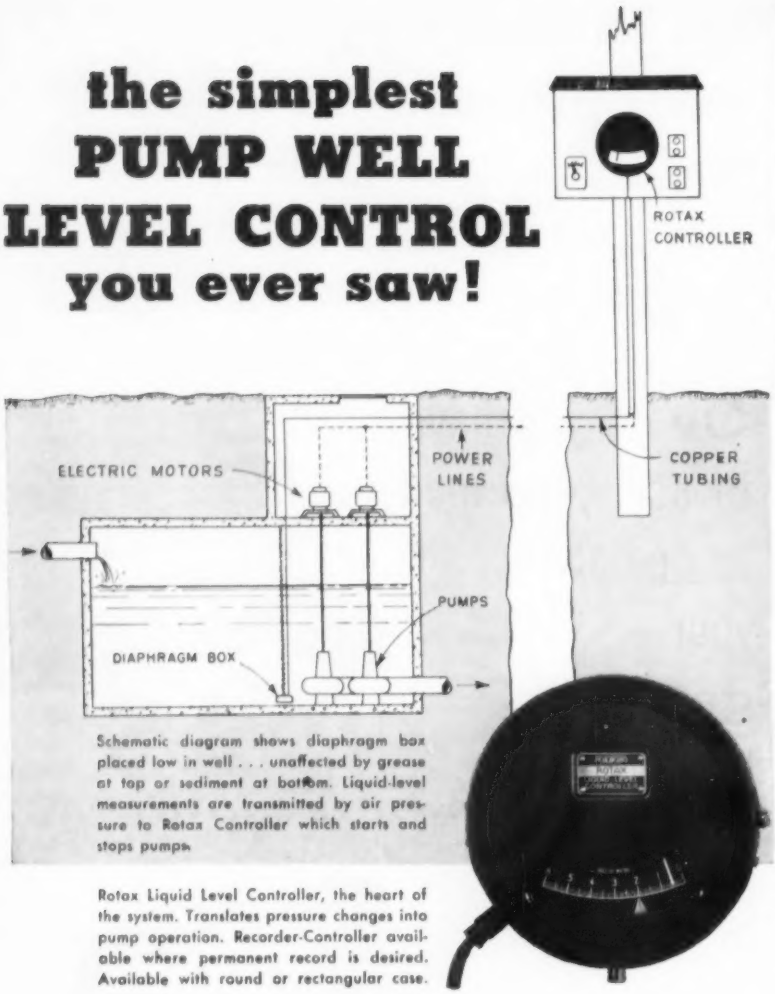
GOLDEN ANDERSON *Valve Specialty Company*

1244 RIDGE AVENUE, PITTSBURGH 33, PA.

DESIGNERS AND MANUFACTURERS OF:

Non-Return Valves • Altitude Valves • Solenoid Valves • Engine Stop Valves • Swing Check Valves Float Valves • Pressure Reducing Valves • Surge Relief Valves for air, gas, steam and water

the simplest PUMP WELL LEVEL CONTROL you ever saw!



Schematic diagram shows diaphragm box placed low in well . . . unaffected by grease at top or sediment at bottom. Liquid-level measurements are transmitted by air pressure to Rotax Controller which starts and stops pumps.

Rotax Liquid Level Controller, the heart of the system. Translates pressure changes into pump operation. Recorder-Controller available where permanent record is desired. Available with round or rectangular case.

Easier to install . . . accurate for years without attention

For a new underground sewage pumping station, the town of Norwood, Mass., wanted automatic control that would perform dependably without attention, free from usual corrosion and maintenance problems. Foxboro Pump Well Level Control proved an effective solution . . . with the added advantages of greatly simplified installation and operation.

Foxboro Pump Well Level Control employs a simple cast iron or bronze diaphragm pressure box for measurement . . . instead of a float-type measuring system. No cables, levers, floats or pulleys to corrode or clog. The Foxboro Controller may be located up to 500 ft. from the well, with only a copper or stainless steel tube connection. All adjustments easily made at the instrument. Controller contacts not subject to corrosive atmosphere.

Get full details of this improved automatic Level Control for either water or sewage pump wells. Write for Application Engineering Data Sheet 831-9. **The Foxboro Company, 268 Norfolk St., Foxboro, Mass.**

FOXBORO Reg. U. S. Pat. Off. PUMP WELL LEVEL CONTROL

Get full details of this month's products . . . mail your Readers' Service card today.

Easier Sign Erection With Overhead Supports

351. Overhead signs for more effective highway marking on today's high speed systems can be erected safely and effectively with Monotube overhead sign supports, described in a new folder by The Union Metal Mfg. Co., Canton 5, Ohio. Standard design data and typical arrangements are furnished in Folder TR-100. Get a copy by checking the coupon.

Get This Helpful Sign Manual

367. Detailed information on all classifications of National Standard Signs for control of traffic, street identification and other purposes, together with a complete line of accessories is presented in a convenient Sign Manual by Lyle Signs, Inc., 2720 University Ave., S.E., Minneapolis 14, Minn. For a copy, check the coupon.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the coupon.

Here's Help for Laboratory Planning

369. A comprehensive laboratory planning guide that tells the engineer and designer how to obtain maximum space economy; utilize new and present facilities; and use functional design in locating utilities, ventilation and lighting is now available from Metalab Equipment Corp., Hicksville, L. I., N. Y. Complete data includes sectional and interchangeable lab equipment, furniture and accessories. Check the coupon for this valuable planning aid.

Boltless Tapping Sleeves Speed Installations

370. Boltless tapping sleeves for cast iron and asbestos-cement pipe offer top economy by eliminating caulking, cutting down excavation and speeding up installations. Be sure to investigate this new product. Write Corey Mfg. Co., 3279 Verdugo Rd., Los Angeles 65, Calif., or check the coupon.

Hydraulic Pipeline Scraper For Water and Sewer Mains

371. Compact folder telling how water and sewage force mains can be cleaned the easy way with the Flex-O hydraulic Pipe Line Scraper is offered by Carver-Stimpson Pipe Cleaning Co., Walthers, Okla. Check the coupon today.

Hydraulic Mower Cuts Costs as Well as Grass

372. Simple, conveniently located controls, smooth cutting action and easy maintenance add up to more mowing per day with the Anderson hydraulic mower. Available for mounting on most leading makes of tractors. Get full data from A. C. Anderson, Inc., Wildwood, N. J. by checking the coupon.

Helpful Data On Pipe Repairs

373. CirclSeal clamps for repair of breaks, leaks of corroded areas in all types of service pipe are described in bulletins issued by R. H. Baker & Co., 2070 E. Slauson Ave., Huntington Park, Calif. Check the coupon for your copy.

Versatile Road Wideners Improve Highways at Low Cost

374. In illustrated bulletins describing Apsco road wideners and base pavers you will find full data on two versatile pieces of road-building equipment that will help you hold down costs while bringing old roads up to present day standards. Get the full story today by checking the coupon, or write to Blaw-Knox Equipment Div., Blaw-Knox Co., Pittsburgh, 38, Pa.

Gutter-Sealing is Preventive Maintenance for Streets

375. Be sure to investigate the special properties of Jennite J-16, a tar pitch emulsion that seals gutters and other areas and stops damage from gas and oil leaks from parked cars. Full data is offered by Maintenance, Inc., Wooster, Ohio. Check the coupon.

BUCYRUS-ERIE HYDROCRANE six ways better for so many park jobs

Only the Bucyrus-Erie Hydrocrane can offer you this combination of time-saving, cost-cutting features:

1. **"Reach-ability"** — Boom is equipped with 8 ft. hydraulically telescoping section that reaches into windows and doorways . . . across fences, flower beds, shrubbery . . . without moving crane an inch.
2. **Maneuverability** — Extremely short tail swing (about 4½ ft.), low overall height plus boom telescope permit maneuvering the Hydrocrane in close quarters that stop other outfits cold.
3. **Stability** — Four husky outriggers extend and retract hydraulically in seconds — permit levelling crane from operator's station . . . give Hydrocrane exceptional lifting capacity.
4. **Mobility** — Zips along open highways at speeds up to 50 mph, maneuvers in traffic easy as an auto.
5. **"Control-ability"** — Fully hydraulic, for precision control. Simple hand levers only — no foot brakes. Unskilled men have learned to run it in a few hours.
6. **Convertibility** — Crane has actually been converted to Hydrohoe front end *by one man in less than one hour!* On trenching, telescoping boom cuts lost time on move-ups by 40 percent.

PARK-PROVED IN ALL THESE JOBS

- Setting stone slabs
- Replanting trees
- Excavating for gas lines
- Cleaning sunken gardens
- Laying pipe
- Setting flag poles
- Removing trash
- Grading around buildings
- Snow removal
- Building ponds and dams
- Stockpiling material

Get the full story on the ⅜-yd. Hydrocrane with its many attachments.

SEND COUPON TODAY . . .

Here the Hydrohoe starts a trench cut. Available with either 12- or 18-in. dipper — equipped with hydraulic ejector that kicks dirt out.

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BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Gentlemen: ☐ Please send me Hydrocrane literature.
☐ Please send me Hydrohoe literature.

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Thousands use our Readers' Service card to keep up to date . . . do you?

To order these helpful booklets check the coupon on page 38.

CONSTRUCTION EQUIPMENT AND MATERIALS

"Encyclopedia" on Bulldozers

97. Every size and style of bulldozer made by Caterpillar Tractor Co., Peoria 8, Ill. is shown in a 36-page booklet, Form 30461. Cutaway views showing details, important components of hydraulic and cable controls, attachments such as brush, root and rock rakes, treedozers and stumpers are also included. Get this interesting publication by checking the coupon.

Examining a Tractor Piece by Piece

99. The 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-9 Diesel is considered separately. These piece by piece discussions are supplemented by notes on easy servicing, versatile applications and attachments for every need. Get your copy of form CR-313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

Booklet Helps Design of Custom-Engineered Steel Buildings

110. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

Makes Underground Pipe Installations Easy

115. One-man operated hydraulic pipe pusher pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213, Greenlee Tool Co., Rockford, Ill. Just check the coupon.

Have You Investigated Aluminum Gratings?

200. Aluminum gratings for walkways, bridge decking, and stair treads save weight, resist corrosion and are easily handled. Get complete design data, including safe load tables, standard panel widths and weights, from Irving Subway Grating Co., 50-53 27th St., Long Island City 1, N. Y. Just check the handy coupon.

8 Reasons Why You Should Check the Jaeger Loader

207. In a profusely illustrated 16-page catalog devoted to the applications and special design features of the Jaeger "Load-Plus" tractor-loader unit, eight good reasons listed to back up the claim that this machine outproduces any other loader of its size. These include load capacity, balance, reach, maneuverability, automatic power adjustment by torque converter, instant reversal, multiple speed and ease of control. Check them all by getting a copy of Catalog L100-3. Check the coupon today. Jaeger Machine Co., 400 Dublin Ave., Columbus 15, Ohio.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Not Sure You Need A Hydrocrane? Just See What One Can Do!

185. In one of the most appealing bulletins we have seen there are over 100 illustrations showing the versatile, all-hydraulic Hydrocrane performing dozens of different jobs. You could keep one busy with digging, trenching, backfilling, cleaning catch basins, loading and unloading, hoisting and erecting, materials handling, placing pipe, and on many other applications. For the full story of this mobile, truck-mounted machine just check the coupon today. Bucyrus-Erie Co., South Milwaukee, Wis.

Trencher Fits Municipal Needs

315. A bulletin describing the Cleveland Model 95 trencher has been published by the Cleveland Trencher Co., Cleveland 17, Ohio. The Model 95, called "The standard machine for city and suburban work", is versatile, manueverable and economical for use on water lines, service lines, road widening and all utilities trenching. Get this 8-page illustrated bulletin by checking the coupon.

The Loader That Digs Like a Power Shovel

317. The power crowder-arm of the Lessmann loader gives you power shovel advantages in this tractor-mounted unit, and enables you to fill the bucket in tough digging without spinning the wheels. Check the coupon for all the details on this rugged, heavy-duty unit. Lessmann Mfg. Co., Des Moines 4, Iowa.

Get Comprehensive Data On Johns-Manville Products

338. A new 40-page Industrial Products Catalog which offers essential data on asbestos-cement pipe, packings, insulations, construction materials and numerous other products is now available from Johns-Manville, 22 East 40th St., New York 16, N. Y. You will find this compact catalog a valuable reference item. Check the coupon for a copy.

PALMER

FILTER BED AGITATORS

TECHNICAL ADVANTAGES

- 1—Requires an average of 40% less wash water
- 2—Completely eliminates mud balls
- 3—Eliminates cracking or shrinking of the beds
- 4—Produces "new" filter media after short period of normal operation
- 5—Turns out purer, better tasting water
- 6—Low installation cost
- 7—Low operating cost
- 8—More water through the filters
- 9—Less "time out" washing filters

PALMER

ANTHRAFILT FILTER MEDIA

FAR SUPERIOR to Sand or Quartz Media, as it Doubles length of Filter runs, nearly halves wash water needs; with less coating, caking, or balling.

Filters are in service more as wash water cycle shorter. Better removal of bacteria, taste, odor. Increased Filter output, better effluent. Ideal for industrial acid and Alkaline solutions. Ask any user.

PALMER FILTER EQUIPMENT CO.

822 E. 8th St. • Erie, Pa.

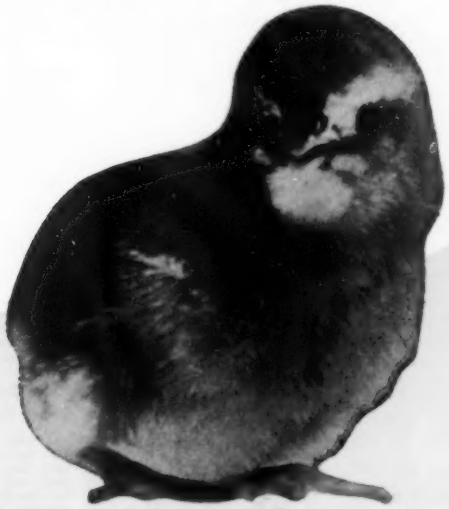
The NEW IMPROVED **NETCO** CATCH BASIN CLEANER WITH PNEUMATIC CONTROLS

A Necessity For Every Municipality

Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the Netco can be operated continuously, averaging 20 to 30 catch basins a day. The Netco with its two powerful pneumatic buckets (orange peel or clamshell) is simple to operate, has a hoisting capacity up to 1500 lbs., and easily removes all debris through openings as small as 16 inches. *Send for our six-page descriptive folder.*

NETCO DIVISION
CLARK-WILCOX COMPANY
118 Western Avenue
Boston 34, Massachusetts

Which came first?



. . . we don't profess to know whether it was chick or egg. One first we do know about is the Nichols Monohearth, first circular mechanically stoked refuse incinerator, now more than ever the first choice of modern-minded municipalities for economical, dependable, odor-free refuse disposal.

More than 17,500 tons of daily Monohearth incinerator capacity are now in use in sixty-four municipalities. Write for more information.

Nichols Monohearth

Mechanically Stoked Refuse Incinerators

NICHOLS ENGINEERING & RESEARCH CORP. · 70 Pine St. · New York 5 · N. Y.

1637 N. Illinois St., Indianapolis 2, Ind. • 40 S. Los Robles Ave., Pasadena 2, Calif. • 1477 Sherbrooke St. W., Montreal 25, Canada

. . . and Nichols Herreshoff multiple hearth dryer-incinerators for sewage sludge disposal

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

To order these helpful booklets check the coupon on page 38.

Your Property is Worth Good Protection

176. When installing link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by **Continental Steel Corp., Kokomo, Ind.**

Design Data on Steel Sheeting Headwalls

268. An engineering data sheet showing the application of Armco Interlocking Type steel sheeting for headwalls of corrugated metal drainage structures is available from Armco Drainage and Metal Products, Inc., Middletown, Ohio. Suggested headwall designs and installation notes are included. Get a copy by checking the coupon.

Design Data on Universal Concrete Cribbing

274. Complete information on concrete cribbing for embankment retaining walls, bridge abutments, highway underpasses and other structures will be found in a new bulletin issued by the Universal Concrete Pipe Co., 297 S. High St., Columbus, Ohio. Check coupon for free copy.

WATER WORKS

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes, Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the coupon.

Meters and Instruments For Water Works

43. An attractively arranged 20-page booklet issued by Sparling Meter Co., Box 3277, Los Angeles 54, Calif., furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the coupon for your copy.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Useful Data on Butterfly Valves

100. Complete descriptions and tables of dimensions on the full line of Rockwell Butterfly Valves is contained in several bulletins published by the company. Construction details and special control features are illustrated. Write W. S. Rockwell Co., Eliot Street, Fairfield, Conn.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

Specs for Gate Valves

112. Rigidly inspected gate valves for pressures up to 175 lbs. by R. D. Wood Co. Sizes 2" to 30"; for any standard type joint. R. D. Wood Co., Public Ledger Bldg., Philadelphia 5, Pa.

Helpful Data on Water Works Products

49. A completely new catalog covering the entire line of water distribution and service products offered by the Mueller Company, of Decatur, Ill., is now available to engineers and water works superintendents. The 328-page catalog features an easy-to-use sectional indexing arrangement to facilitate quick reference to any of the hundreds of products listed. A large section of useful engineering information is included. Check the coupon today.

Painting Water Tanks For Longer Protection

52. High labor costs demand special consideration when painting elevated water tanks. This and other factors involved in proper paint selection are discussed in a bulletin issued by Jos. Dixon Crucible Co., Jersey City 3, N. J. Helpful specifications for repainting water tanks are also included. Check the coupon today.

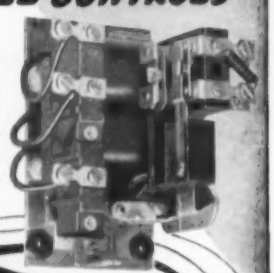
Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 50 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

Pipe Detector Determines Exact Location and Depth

120. Determination of the exact location and depth of buried pipes, valves, service cables and other metallic objects can save costly digging and unnecessary damage. Your work can be speeded when you use the Detectron pipe detector, which features simple operation, shielding to avoid static interference, economical unit construction and a lifetime guarantee. Get full data from Detectron Co., 5631 Cahuenga Blvd., No. Hollywood, Calif., by using the coupon.

All Electric·Floatless
LIQUID LEVEL CONTROLS



Positive! Dependable! Economical! No floats! No vacuum tubes! No moving parts in liquid. Unaffected by acids, caustics, pressures or temperatures.

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FIRST IN THE FLOATLESS CONTROL FIELD

LONGER RANGE—TARGET VALUE FOR YOUR HIGHWAY TRAFFIC SIGNS WITH GROTELITE REFLEX REFLECTIVE SHEETING

Grotelite
REFLECTIVE SHEETING

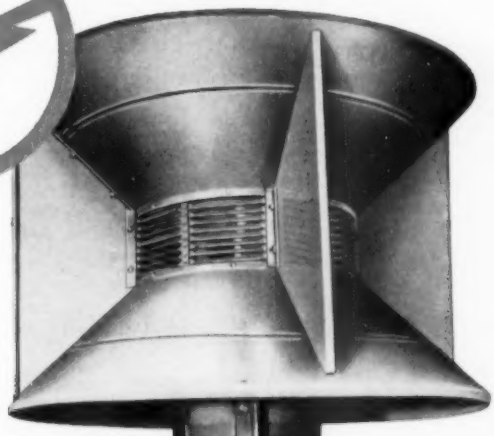
SMOOTH S S SURFACE

This highly reflective, smooth surface reflex reflective sheeting makes a smashing, attention-compelling sign with longer range target value and full range legibility. Easily read night or day. The smooth, durable, self-cleaning surface can be screened, sprayed or brushed. It is easy to apply and makes the best long life, economical signs and markers. Available in sheets and completed signs.

THE Grote MANUFACTURING CO., Inc.
GROTE SQUARE - BELLEVUE, KY.
(Established 1901)

Complete Line of Embossed Metal Traffic Signs, Reflectors and Street Name Plates

FEDERAL
SD-10



DUAL-TONE

AIR RAID WARNING SIGNAL

"All air raid sirens purchased under the 1954 matching-funds program for air raid warning devices must be dual-tone"

The Federal SD-10 siren is the new double tone version of Federal's STL-10 siren used so successfully by the City of St. Louis for air raid protection.

The SD-10's exterior features, modified to enhance the dual-pitch sound waves, conceal but do not eliminate any of its advanced principles of design. The SD-10 gives you greatly increased sound output without increased power consumption, more effective inverted design and simplified mounting. Truly a siren worthy of becoming a partner with other famous Federal Sirens designed for Air Raid applications.

The same company — The same quality products — but, see our new name—

Write today for full facts —ask for Bulletin No. 6

FEDERAL SIGN & SIGNAL CORPORATION

formerly: FEDERAL ENTERPRISES, INC.
8733 S. State St., Chicago 19, Illinois

Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 38.

Discussion of Ranney Method For Municipal Water Production

116. A very interesting study of municipal and industrial water supply problems and a complete discussion of Ranney Collectors for water production will be found in a 20-page booklet published by Ranney Method Water Supplies, Inc., Box 277, Columbus 9, Ohio. Water quality, construction methods, costs, performance and other topics are considered. Check the coupon to get your copy.

Complete Booklet on Pipe Line Equipment

246. Equipment for all types of jointing, maintenance and repair jobs on water, gas and sewer lines is described and illustrated in Catalog No. 25 issued by Joseph G. Pollard Co., New Hyde Park, N. Y. Leak detectors, pipe finders, melting kettles, cleaning tools and a full line of hand tools for water and sewer departments, and many other items are included. Be sure to get your copy now. Just check the coupon.

How Engineers and Contractors Can Get This Comprehensive Water Control Apparatus Catalog

141. A 250-page catalog showng the full scope of Rodney Hunt water control apparatus is now available for distribution to consulting engineers, contractors and others actively engaged in water control construction work. Hundreds of diagrams, detailed descriptions and specifications show all types of sluice gates and related items, and a special section provides helpful engineering data. Send your request on business letterhead or use the coupon, stating your occupation. Rodney Hunt Machine Co., 7 Water St., Orange, Mass.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

How to Tap Concrete Pressure Pipe

126. The simple steps required in making a pressure tap in concrete pressure pipe are explained in a booklet issued by Lock Joint Pipe Company. Be sure you know how either large connections or small service outlets may be made economically and without sacrifice of strength. Just check the handy coupon. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Avoid Needless Digging With This Valve Box Locator

165. Convenience and accuracy are key notes of the Aqua Valve Box locator describea in a full-color folder offered by Aqua Survey and Instrument Co., 2518 Leslie Ave., Cincinnati 12, Ohio. Cobalt alloy steel dipping needle is factory-set for any geographic location. Periscope type mirror arrangement permits effortless top reading. Get full details by checking the coupon.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

Need Data on Swimming Pool Equipment?

180. Every type of swimming pool equipment—boards, ladders, slides, safety equipment and related accessories—fully described and illustrated in attractive folder issued by American Playground Device Co., Anderson, Ind. All units feature modern design and superior construction to give lifetime service. Check the coupon for this attractive folder.

Get This Helpful Data On Valve Boxes

187. Full details on service, roadway and valve boxes, meter boxes, frames and covers are included in Bulletin 2000 issued by Alabama Pipe Co., Anniston, Ala. All standard sizes are listed, together with prices, and instructions are furnished for handling special designs. Check the coupon for your free copy.

What You Should Know About The Centriline Process

197. The Centriline method for lining mains in place to stop leaks, prevent corrosion and increase carrying capacity is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered. Check coupon for your copy.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 53 issued by M & H Valve & Fittings Co, Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the coupon for your copy.

New Portable Dryer

H&B ESTABLISHED 1907

makes the

Moto-Patcher

A Highly Efficient Hot Mix Plant

The addition of this new portable dryer makes the H & B Moto-Patcher a highly efficient hot-mix plant for all types of patching, including building up weak shoulders, also for use on driveways, parking areas and other small paving jobs.

The dryer drum is 8 ft. long by 30" diameter, with a drying capacity up to 10 tons per hour. Aggregate may be fed by hand or directly from truck by means of a small chute attached to the tail gate. There is a towing hitch for readily attaching to any standard make truck.

New Spreader Attachment

This spreader attachment, which is optional equipment with the Moto-Patcher, is 8 ft. wide and is fully adjustable to specified grade and crown, insuring a uniformly smooth surface even on irregular pavement.

Bulletin MPD-53 gives complete information on the Moto-Patcher, Dryer and Spreader. See your local H & B distributor or write direct.

HETHERINGTON & BERNER INC.

America's First Builders of Asphalt Mixing Equipment

700 Kentucky Avenue — Indianapolis 7, Indiana

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this dozer has all the angles!

This hydraulic angling blade is a great time saver. It angles to either side by hydraulic control from the tractor seat. Other blade attachments include—stationary angling blade, manually controlled angling blade, snow plow and hydraulic tilt blade.

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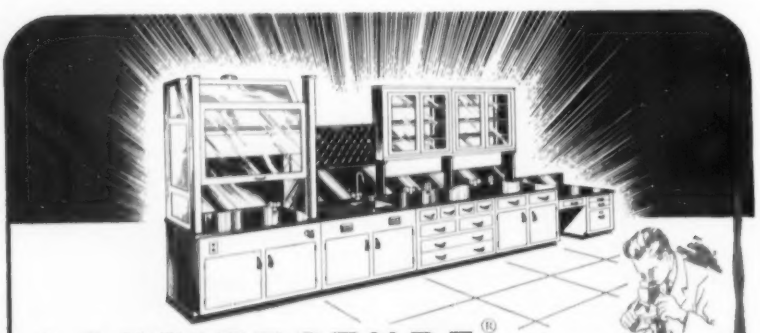

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Heating, Thawing and Melting With Hauck Burner Equipment

277. A helpful 16-page bulletin covers the complete line of Hauck heating and melting equipment. Data covers units for every water, sewer and street department purpose, from "one-man" burners to large size portable kettles. For a useful addition to your reference file, get Bulletin 1068 from Hauck Mfg. Co., 117-127 Tenth St., Brooklyn 15, N. Y.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Technical Bulletin on Solenoid Operated Valves

288. Full technical data on applications, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2-in and 2½ to 36-in. sizes. Get all the details; just check the coupon.

Helpful Data On Valve Boxes

291. Bulletin 35 issued by Buffalo Pipe & Foundry Co., Box 55, Sta. B., Buffalo, N. Y., gives full details on adjustable valve boxes, extension boxes and roadway boxes for water and gas. Get your copy by checking the coupon.

Controller Maintains Water Level In Treatment Basins

348. Instrumentation which maintains liquid level in sedimentation basins, and thus controls level in succeeding treatment basins, is described in Application Engineering Data Sheet No. 831-20, issued by The Foxboro Co., Foxboro, Mass. All components are described in the illustrated data sheet. Get your copy by checking the coupon.

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29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Get Data Now On This Catch Basin Cleaner

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

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93. Be sure to investigate the hydraulically operated ground drive offered by Baughman to give you the advantages of two drive speeds and uniform distribution of material regardless of truck speed, but without the need for power takeoff or transmission. Full data on this and many other features in Form A-380. Baughman Mfg. Co., Jerseyville, Ill.

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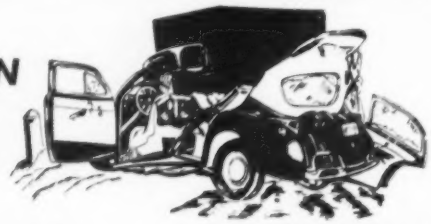

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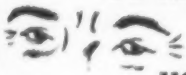

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Faster Compaction On Street Repairs

108. Holes and trenches cut through pavement present difficult areas for compaction of backfill. Learn how to do the job quickly, easily and cheaply by using the self-contained, portable Barco Rammer. Full data on this low cost will be found in Bulletin 621. Write Barco Mfg. Co., 500 No. Hough St., Barrington, Ill., or check the coupon.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the coupon for your copies.

Cut Road Building Costs With A Tamping-Leveling-Finisher

175. For a full description of roadbuilding methods with a tamping-leveling-finisher which lays a smooth mat without forms, tamping and compacting to desired grade, get Bulletin 879-A from Barber-Greene Co., Aurora, Ill. Check the coupon today.

Self-Propelled Sidewalk Paver Lays Up to 10 Ft. per Minute

203. The Dotmar paver, which can lay up to 10 ft. per minute of sidewalk, may be converted readily to pave curb and gutter or integral curb, gutter and walk. Full details in 8-page Bulletin 52, released by Dotmar Industries, Inc., Kalamazoo, Mich. Just check the handy coupon.

What Should You Look For In a Power Sweeper?

206. Helpful information to aid you in the selection of a power sweeper to fit your needs is provided in Bulletin 85.2, issued by G. H. Tennant Co., 2530 N. Second St., Minneapolis 11, Minn. Full data on the highly maneuverable Tennant Model 75 Sweeper is included. Get your copy by checking the coupon.

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304. By preparing your patching mixtures, hot or cold, right on the job, you can use them immediately with a minimum of handling. Get full data on the McConnaughay Model HTD "Multi-Pug" Asphalt Mixer for fast, easy and economical preparation of patch materials. Write K. E. McConnaughay, Lafayette, Ind. or use the coupon.

Cut the Cost of Road Rehabilitation

332. Be sure to investigate the Hetherington & Berner "Moto-Paver," the machine that does a complete mixing and laying job in one continuous operation. Specifications and complete information on both standard and heavy-duty models is provided in Bulletin MP-53. Get your copy from Hetherington & Berner, Inc., Indianapolis, Ind., or check the coupon.

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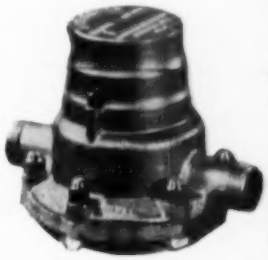

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What You Should Know About Chemical Weed Control

132. In a convenient 44-page book, the C. B. Dolge Co. gives full details on spraying procedures and chemicals to use for control of lawn and roadside weeds, ragweed eradication and insect control in turf. Get your copy by checking the coupon or write C. B. Dolge Co., Westport, Conn.

CIVIL DEFENSE

Think of Aerial Surveys When You Need Maps

311. Every engineer and public official should investigate aerial surveys for maps of new areas, up-to-the-minute maps for city planning, highway relocation, surveys to plan extensions of sewers, water mains and utilities. Precise contours for topographic maps and other data in any detail desired can be furnished by Aero Service Corp., 236 Courtland St., Philadelphia 20, Pa. Interesting booklet on aerial mapping services and methods available by checking the coupon.

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP-31 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 30 Kw, portable and stationary, are described. Write the Kohler Co., Kohler, Wis., or use the coupon.

Get the Facts on Air Raid Sirens

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Does Your Water Works Have Standby Power?

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SEWERAGE AND WASTE TREATMENT

Complete Sanitation and Process Equipment Bulletin

40. A complete illustrated bulletin gives detailed information on all "Rex" sanitation and process equipment. 36 pages of engineering data, process descriptions, conversion factors. Get Bulletin 51-83 by checking the coupon. Chain Belt Co., Box 2022, Milwaukee 1, Wis.

Design Data for the Spiraflo Clarifier

124. Be sure to investigate the advantages of the Spiraflo clarifier for sewage treatment. Full engineering data, description of the unit, test results and specifications are offered in 24-page Bulletin 122 by Lakeside Engineering Corp., 222 W. Adams St., Chicago, Ill. Check the coupon today.

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill.

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249. Details on the proven use of copper sulfate to control root and fungous growths in sewers are contained in a brand-new book published by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y.

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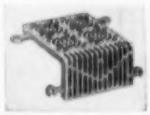

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How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Floatless Liquid Level Controls

92. Complete descriptions of electrode type floatless liquid level control systems, including control units, electrodes and fittings, panel assemblies and diagrams of typical installations for all types of municipal service are covered in the 32-page catalog of Charles F. Warrick Co., 1956 W. Eleven Mile Rd., Berkley, Mich. Check coupon for your copy.

Chemicals Used in Water, Sewage and Waste Treatment

248. A 16-page technical bulletin offered by Omega Machine Co., 345 Harris Ave., Providence, R. I., compiles in convenient form full information on the chemicals used in water, sewage and waste treatment. Data includes formulas, common names, commercial strengths, forms in which they may be obtained, sizes of shipping containers, and many other items, including recommendations for handling and feeding. Get this useful bulletin by checking the coupon.

Data Offered on Water, Sewage and Waste Treatment Equipment

263. Equipment for sewage treatment, water purification and industrial waste treatment is described in a 16-page Book No. 2440, published by Link-Belt Co., Colmar, Pa. Case histories, photographs and schematic drawings are included. Straightline and Circuline collectors, Thru-Clean and Straightline bar screens, Tritor screens, flash mixers, scum breakers and other units are described. Check the coupon for your copy.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

Waste Treatment Equipment and Controls

240. A new leaflet giving data on W&T Visible Vacuum Chlorinators and a variety of automatic controls to meet waste treatment problems has been published by Wallace & Tiernan, Inc., 25 Main St., Belleville 9, N. J. Get this helpful information by checking the coupon.

Reference Book on Lubricated Plug Valves

273. Lubricated plug valves, including stick-proof lever sealed valves for easy operation and positive mechanical seal are fully described in reference books issued by Homestead Valve Mfg. Co., Box 550, Coraopolis, Pa. Check the coupon for your copy.

Helpful Design Data For Sewage Ejectors

81. The applications and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletin for engineering data, diagrams of typical installations and details of component parts. Check the coupon or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 40-page booklet issued by Flexible Sales Corp., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Effective Shredder For Dried Sewage Sludge

72. The rugged and compact Royer Sludge Disintegrator does a quick and effective job of preparing sludge for use as a fertilizer on city properties or for sale to others. Several models, portable and stationary, suitable for every size plant and power source are described in Bulletin 643-A, issued by the Royer Foundry and Machine Co., Kingston, Pa. Get a copy by checking the coupon.

Efficient Blowers for Activated Sludge Plants

232. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Roots-Connersville Blower Corp., Connersville, Ind.

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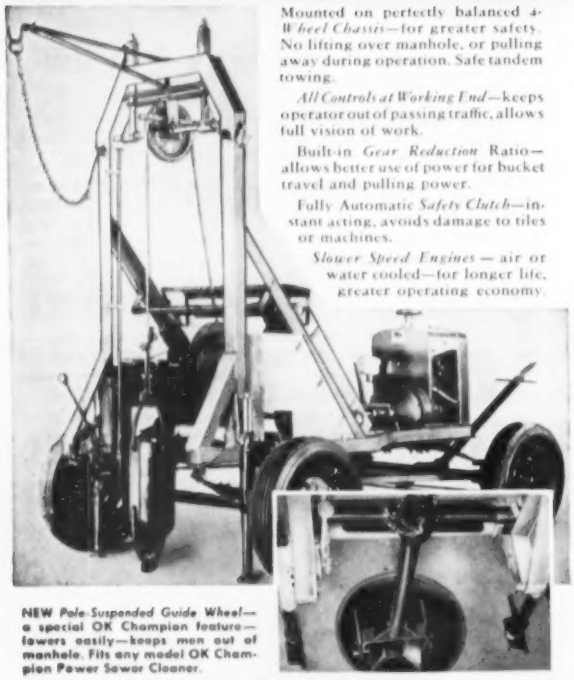

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4 More PRODUCTS ADDED TO THE BLAW-KNOX LINE

2 BIG CAPACITY BASE PAVERS

MODEL P-150 **is the time and money-saving unit that cuts weeks off base pavement schedule time! It spreads stone, slag, gravel, soil cement or crusher run aggregates at a 400 ton per hour rate in depths up to 20″ and widths up to 16′. V-type hopper and oscillating screed eliminate segregation of material. There's ample traction for soft going and plenty of power to push your truck. Operating and maintenance costs are low.**

MODEL P-120 **handles up to 150 tons per hour in widths up to 12′ and depths up to 16″. Tractor grader type tires on dual rear wheels provide plenty of traction and flotation. Heavy angle-type screed evenly distributes the fines to prevent segregation. Straightedge leveling reduces the need for hand dressing behind the unit for accurate results.**

2 MONEY-SAVING ROAD WIDENERS

MODEL 85 **handles concrete, asphaltic concrete and any kind of aggregate *without forms* to save money on road widening jobs. The strike-off gate confines and distributes the concrete over the desired strip, then the independently powered vibrator "sets up" the concrete. The trailing shoe neatly shapes it. Model 85 handles 2′ to 8′ widths.**

MODEL 95 **also requires no forms for accurate results and will spread and finish concrete up to 1½ miles per day. The capacity of this unit to receive and deposit dirt, gravel or other comparable material keeps a fleet of dump trucks busy. It will build your earth shoulders on any paving job at the rate of 200 tons per hour! Model 95 handles 2′ to 10′ widths.**

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BLAW-KNOX ALSO MANUFACTURES A *"Complete Package"* OF CONCRETE PAVING AND READY-MIX EQUIPMENT

Here's your *only* source for every piece of equipment you need . . . from forms to finisher, or from batching plant to truck mixer . . . all in one profitable "package". Ask your Blaw-Knox distributor for full details about "Complete Package" *one-source* advantages.

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Get full details of this month's products . . . mail your Readers' Service card today.

Digs Tank Bed in Hard Rock

IN DALLAS, TEXAS, a formation of hard white rock was encountered on the site of a 2,000,000 gallon prestressed concrete water tank, one of the largest of this type in the U.S. The rock bed was so hard it posed a real excavation problem for Whittle Construction Co.

Whittle whipped the problem by using a CLEVELAND Model 140 Trencher to cut closely spaced shallow trenches across the rock formation. This excavated a considerable volume of rock and enabled the dragline bucket to bite into the weakened ridges of rock between the trenches. As each layer of rock was cleared away the CLEVELAND dug the next level and prepared

it for haul out by the dragline.

This job is only one of hundreds of unusual applications that have proved time and again over 30 years the outstanding toughness and versatility of CLEVELANDS—and their ability to dig *more trench in more places at less cost* for you.

Get the Full Story on CLEVELANDS from Your Local Distributor

THE CLEVELAND TRENCHER CO.

"Pioneer of the Modern Trencher"

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Design Data on the Circuline Sludge Collector

237. All the information you need for the design of circular settling tanks using the Link-Belt Circuline sludge collector will be found in 20-page Book No. 1982, published by Link-Belt Co., P.O. Box 472, Lansdale, Pa. Capacity tables, suggested sizes for all piping and design details are included. Check the coupon for your copy of this valuable booklet.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Have You Heard About Bionetics For Sewage Treatment?

350. Bionetics, a dry staple powder of groups of living organisms preserved with enzyme systems, is available in several types to improve and accelerate the biological processes performed at sewage treatement plants. Get full data from Reliance Chemicals Corp., Box 6724, Houston 5, Texas. Just check the handy coupon.

TRAFFIC SIGNS

How Reflective Sheeting Improves Traffic Signs

157. Get full data on Grotelite reflective sheeting for smooth, brilliant, long-life traffic signs and marking devices from the Grote Mfg. Co., Bellevue, Ky. Use the handy card or coupon today.

REFUSE COLLECTION AND DISPOSAL

Sanitary Landfill Operation and Methods

28. The location and area requirements for sanitary landfill, operation methods for trench type and area fills, equipment selection and costs are items discussed in an 8-page booklet issued by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. Be sure you have this reference when considering the problem of garbage and refuse disposal. Check the handy coupon today.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy coupon.

Get New Data on Garbage Cookers for Hog Feed

287. Data on two types of garbage cooking equipment is now available from Littleford Bros., Inc., 457 E. Pearl St., Cincinnati 2, Ohio. Steam generators, both portable and stationary, are described in Bulletin MP-51; oil fired cooking kettles with special agitator and large discharge door, trailer or skid mounted is covered in Bulletin MP-50. Check the coupon now.

You are standing at the bottom of a lake!

The lake isn't made yet, but when it is filled it will be the Garza-Little Elm Reservoir on the Trinity River in Texas. The outlet-works for this great flood control and water storage project stands before you. It will protect the Trinity River Valley for 300 miles to its mouth in Galveston Bay.

Four 60- by 84-inch Rodney Hunt cast iron bronze-mounted sluice gates with Rodney Hunt hoists control the low-discharge flow of this huge outlet works rising 75 feet (not counting tower) above present ground level. The Rodney Hunt gates operate under heads of 25 to 48 feet.

Specify Rodney Hunt for Sluice Gates and Hoists of superior quality . . . over 2000 combinations of standard types and sizes available . . . and send for our 232-page profusely illustrated catalog. A special 28-page section gives valuable hydraulic engineering data. Write on your letterhead for Catalog WCA 952.

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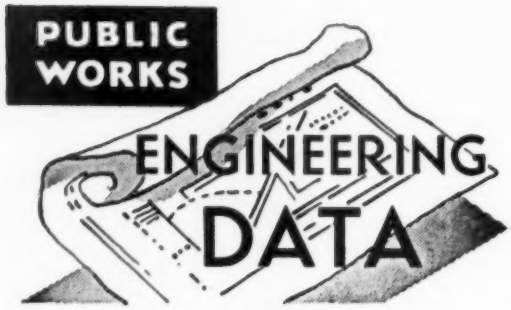


Highway Slope Stabilization

One of the main features of the work of widening San Jose Ave., San Francisco, was the stabilization of the steep westerly cut-slope which had been subject to numerous small landslides over many years. This was described in the city's 1953 report, as follows: After installing a series of tile under-drains, 5,244 tons of quarry-run rock, varying in size from pea gravel to pieces weighing 300 pounds, were placed on benches cut in the slope. The rock, lying on a slope of about 1 to 1, acts like an inclined gravity retaining wall. To prevent the percolation of surface water which might lubricate the underlying earth, two inches of "gunite", a mixture of cement and sand blown into place with pneumatic equipment, was placed over the entire surface of the rock slope. This treatment, which had been found to be quite effective in controlling a previous large slide in the cut, extends for a distance of about 830 feet and accounts for about 39 percent of the contract cost, or $133,-543.10.

Synthetic Resins to Make Snow Plows Work Better

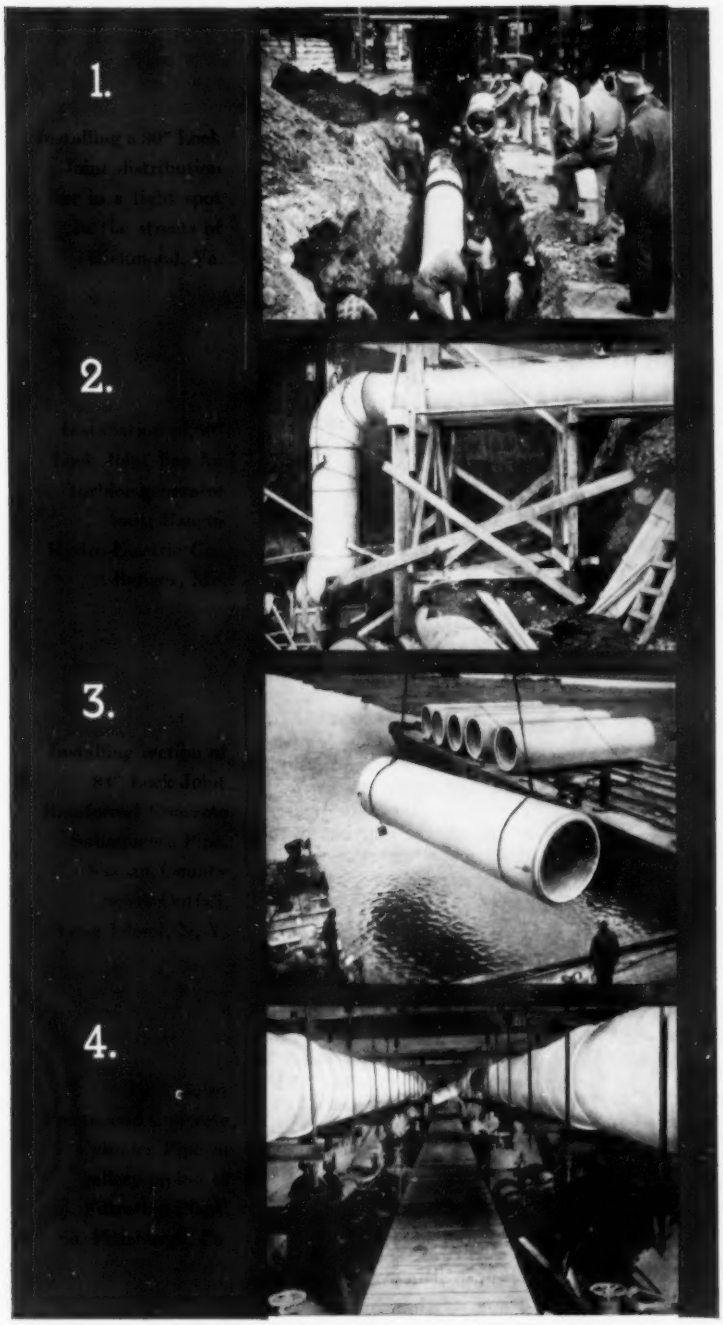
French investigators, in attempts to make snow plow blades more efficient, and to add to the speed of snow clearance, have been experimenting with various materials. It is reported that when snow plow blades were coated with a proprietary material composed of vinyl synthetic resins snow was prevented from adhering with the result that snow clearance proceeded faster and the snow could be pushed farther from the roadway. Though the cost of the material was appreciable, results appeared to justify the cost.

Shrubs as an Aid to Highway Safety

According to an article in the California Highway Patrolman a primary research program covering a 3-year period was completed when Andrew J. White, safety research director, drove a 1953 sedan into a planting at 30 mph. without the protection of a safety belt or a crash helmet.

The plants form an energy-absorbing barrier that stops an average 3,000-lb. car in a relatively short distance, like the application of excellent brakes. Headlight glare can be eliminated by the screen effect of the plant mass. Plantings have the ability to screen out even small animals from the roadway and can absorb traffic noise preventing its entrance to adjacent dwelling areas. Plantings can be used on median strips to separate opposing traffic and to replace guard rails and fences.

The planting tested (Rosa Multiflera Japonica) adds beauty to the highway area with an abundance



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Lock Joint Concrete Pressure Pipe has long been recognized as the ideal, high capacity pipe for water supply lines, but its variety of types and designs has also permitted successful use in the following:

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THESE are some of the major services for which Lock Joint Concrete Pressure Pipe is ideally suited. So, if your pressure pipe problem involves pipe 16" in diameter or larger, call on Lock Joint – the low cost, high capacity, long lasting multi-purpose pipe.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16" in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

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Established 1905

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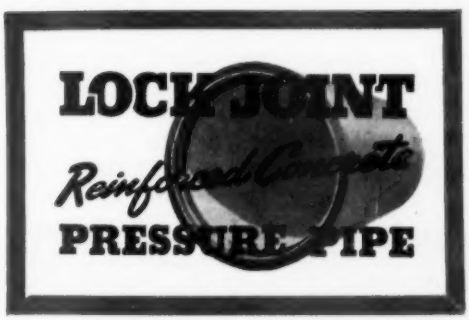

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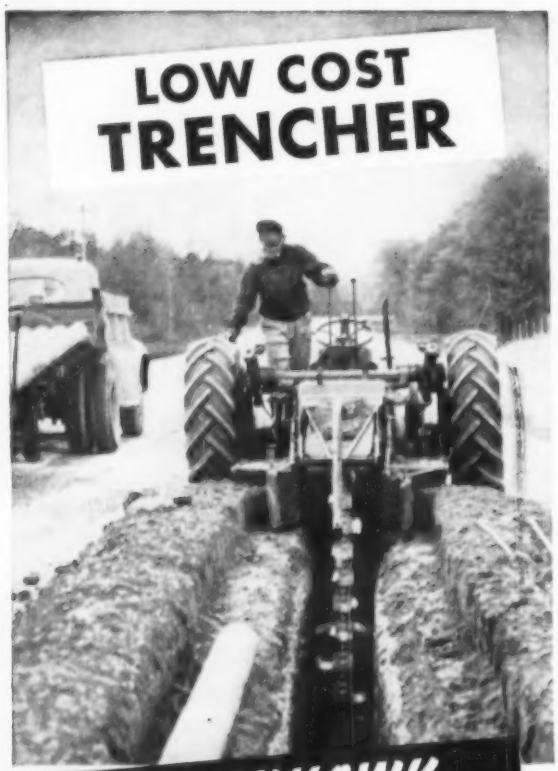

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TRENCH HOG

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Just what you need for trenching utility lines, sewer systems, septic tanks, drainage, etc. A low priced, fast operating, tractor mounted, ladder type trencher. Cuts 6″ to 20″ wide trench down to 7′ depth. Average digging speed 350′ to 400′ per hour. (digs up to 800′ per hour) Digs all soils the year 'round, (super-service cutters for rocky soils or frozen ground). Independent control of each drive wheel assures exact regulation for straight or curved trenches. Mounts on Ford or Ferguson tractor — easily transported — one man operated. Bulldozer blade available for backfilling. Write for complete details today.

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PRODUCTS FOR BETTER FARMS, BETTER INDUSTRIES SINCE 1920

of white flowers in the late spring and red berries in the fall. Initial cost is so low that 15 cents a lineal foot for the plants would create a barrier, in a few years, that could effectively stop a car traveling at 50 mph, without injury to occupants and the vehicle.

Examination of the surface of the test car disclosed two minor paint scratches after three crash decelerations into the same planting. The plant mass did not compress and the third stop was as smooth as the first. One strong point in favor of this type of plant is that it regrows and requires little or no care.

Effect of Sun Glare on Night Accidents

R. H. Peckham carried out a series of tests on a group of 24 drivers to find out the effect of sun glare on the loss of vision at night. As reported in Highway Research Abstracts it was discovered that after a day's driving in moderate sunlight without the use of sun glasses the effectiveness of the evening light ranged from 60 percent for half of the drivers down to 25 percent for a tenth of the group. Recommendations are made that sun glasses should be used by drivers during the day for the purpose of protecting the retina and preparing it for the difficulties of seeing at night with vehicle headlights.

Leaf Removal Simplified by Vacuum Loader

Leaf removal, always a big problem in Richmond, Va., has been simplified by the use of a vacuum leaf-loader. This reduces the need for personnel, and cuts payroll costs. The leaves are used for composting to provide fertilizer for grassy areas. Snow removal also has been modernized through a larger use of chemicals. Because heavy snows are relatively infrequent, the city has purchased snow loaders which, during the warmer months, are used for the loading of crushed stone, sand and cinders.

Two-Way Radio Saves Richmond What It Cost

The two-way radio system installed in 1952 between emergency service vehicles and the Service Division of Richmond, Va., has provided a faster and more efficient service and has proved invaluable during storms and other emergency situations. The savings in personnel and transportation costs, even during the short period the radio system has been in operation, have amounted to several times the cost of installing and operating the equipment.

Federal Aid Program

According to the Bureau of Public Roads, at the end of 1953 there were about 22,500 miles of highway in the active Federal Aid program that is either programmed, has had plans approved or is under construction. About one billion dollars of Federal money and an additional billion of State money are involved. The states still had a balance of about 165 million dollars which had not been allocated to specific projects.

Making Granite Block Skid-safe With Heat

A process has been used in England where jets of flame at a very high temperature (reported to us as 3200° C) have been directed, from a hand propelled generator, onto the road. The surface of the block spalls into grooves about 1/20 of an inch deep following the pattern of the jets thus producing a non-skid effect.

ONE MODEL D belonging to Hamilton County, Indiana, works out of Sheridan on maintenance of roads in that area . . .

ANOTHER MODEL D is strategically based at Fishers, to take care of roads in that section of Hamilton County . . .

THE THIRD MODEL D works on that part of the county's 905 miles of roads around Carmel, where the machine is based.

We maintain 905 miles of roads on limited budget with help of 3 low-cost graders

By Clarence Seymour
Superintendent of County Roads
Hamilton County, Indiana

Our county, like many others, faces the problem of stretching available revenue to cover both the increased cost of road maintenance and the increased need for it as traffic becomes heavier.

Two solutions we have found to the problem are efficient use of labor and wise buying of equipment. By wise equipment purchase we mean buying versatility and year-round utility. For example, the big problem of a county such as ours is road maintenance. We devoted considerable study to this need and found that we could buy three efficient, multi-purpose Allis-Chalmers Model D Motor Graders for about the price of one large grader.

Obviously, one large motor grader could not keep up as many miles of roads as could the three low-cost graders, so we bought three Model D's. These are strategically based at three different points in the county for the most efficient maintenance of our 905 miles of roads—150 miles of blacktop, 752 of gravel and 3 miles unsurfaced.

We find the Model D's are excellent road maintainers, ditchers, mixers and spreaders. We have hydraulically controlled, rear-mounted shoulder maintainers on all three of our machines, which in effect save one pass of the graders on maintenance work. In the winter we use the graders to remove snow and ice from roads over a large area.

★ ★ ★

The shoulder maintainer is interchangeable with a hydraulically operated, ⅝-yd. rear-end loader, which can be used for all kinds of loading and stockpiling. Usefulness of the Model D is further multiplied by other easily mounted attachments — scarifier which has plenty of down pressure and accurate hydraulic control, and both V-type and trip blade snowplows.

Power circle turn and leaning front wheels (both optional) now are available on the Model D. Other big-grader features include tandem drive, tubular frame and hydraulic blade lift.

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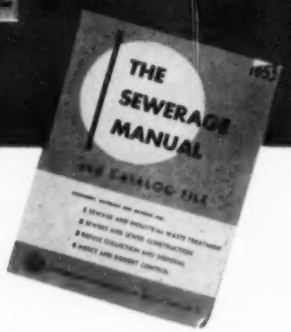

This year it is estimated that close to 400 million dollars will be spent *in new construction alone* for sewage and refuse disposal, rural sanitation and industrial waste treatment. No small responsibility. How can you be sure you're getting the best and the most for the taxpayer's dollar . . . that there isn't some short cut you've overlooked . . . some better way of tackling a problem?

To get the facts — fast — engineers throughout the field "look it up in the SEWERAGE MANUAL". Here you'll find who makes what, where to get it, what's most applicable to every job. It gives you a quick review of the latest approved methods.

Your Memory's Best Friend

The SEWERAGE MANUAL is new each year, and the 1953 edition is current. Though it's jam-packed with facts, they're easy to find, concise, always accurate.

Keep the MANUAL on your desk within easy reach. It's your memory's best friend.

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- Maintenance of Sewers
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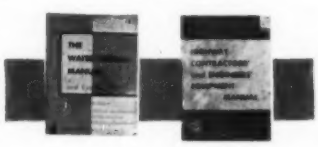
- Refuse Collection and Disposal
- Insect and Rodent Control

Put these to work, too:



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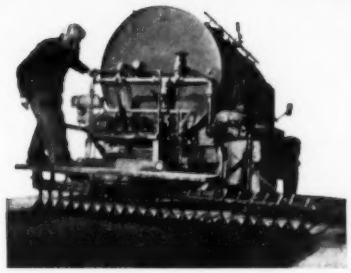
BITUMULS® leads in surface treatment work!



You will be interested in these facts obtained in our recent nation-wide survey:

- In the past five years most of the states in the union have *increased* the volume of sealing and surface treatment work done with asphalt emulsions.
- A majority of the counties in the country now *prefer* the use of emulsions to hot asphalt, tar and cutbacks for surface treatments.

BITUMULS LEADS ALL OTHER EMULSIONS for work of this type. As a pioneer product for Surface Treatments, Bitumuls continues as first choice of road-builders everywhere. It has won acceptance based on speed and ease of application, dependable performance, and long economical service. Bitumuls HV (high viscosity emulsion) holds more cover stone than any other binder. It sets-up faster, and provides a safe, non-skid surface.

Our new booklet, "BITUMULS SURFACE TREATMENTS AND PENETRATION PAVEMENTS," gives full details on all types of Surface Treatments, Single, Double and Triple. There are Bitumuls Engineers working out of offices near you who will welcome an opportunity to discuss your Surface Treatment work.

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LESSMANN LOAdALL

DIGS IN WHILE STANDING STILL!

Check these Features!

- **STANDARDIZED PARTS.** Ford, Timken, Vickers, Bendix, etc., assure highest quality components and low-cost servicing.
- **SAFETY.** Operator has unrestricted visibility and is protected from loader arms.
- **EASY HANDLING.** Full reverse shifting gives LOAdALL four speeds forward and four reverse. Three simple, conveniently located hydraulic controls assure efficiency.
- **LOW COST.** You save on first cost, operating costs and maintenance costs with a LOAdALL.
- **LOAdALL BUCKETS.** Available with capacities of ⅜, ½, ⅞, 1, 1¼ and 1½ yards.

A HIGHLY MANEUVERABLE POWER SHOVEL

Lessmann LOAdALL scoops up big loads of the most heavily compacted soils, cinders, aggregate, etc. . . . does it in 5 seconds while standing still! Extra hydraulic cylinders supply Hydraulic Power Crowd. This means *loading* with hydraulics which eliminates ramming and spinning of wheels . . . *minimizes repairs, reduces maintenance!* Dozer blade is easily attached for grading, backfilling. Crane-hook, lift forks, snow and trash buckets are also available.

9 FT. DUMPING CLEARANCE

LOAdALL has clearance for the highest trucks, bins and mixing hoppers. It loads or unloads at any height from 12″ below wheel level to 108″ above. Wheelbase of 73″ and 12′ turning radius make it highly maneuverable.

52″ REACH

Here's a full 4′4″ reach at maximum clearance! LOAdALL carries load close but quickly boosts it *'way out ahead* for easier loading . . . another advantage of Hydraulic Power Crowd.

HYDRAULIC POWER-CROWD

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ELYRIA, OHIO Also "Flexibles" SAVES MONEY WITH

Like most typical cities which are careful with the taxpayers' money, Elyria, Ohio, chose "Flexible" equipment. Pictured is their modern "Flexible" SeweRoder which takes 9/10ths of the usual hard work out of cleaning sewers – works faster and permits "preventative maintenance" to be carried on due to low cost of operation – without interference by the weather. (Some cities report cleaning sewers for less than 2¢ per foot.) Seen in the picture from left to right are Walt Decker and John Hovis of the city council, Henry Ault, Mayor, Ralph Terry, Safety-Service Director, Art of the sewer crew, and George Carrick, Superintendent. This city knows that "Flexibles" are based on careful study of the problem, and that "Flexible" stands behind every sale – as it has for 20 years.

Write for our **FREE** *Catalog*

Flexible SALES CORPORATION
3786 Durango Ave., Los Angeles 34,
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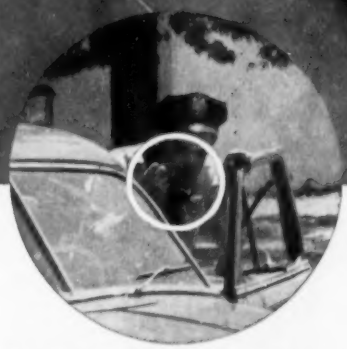
AMERICA'S LARGEST LINE OF PIPE CLEANING TOOLS AND EQUIPMENT



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NEW YORK CITY RELIES ON A G-E COMMUNICATIONS SYSTEM!

". . . entering the third year of operation now . . . this equipment performs as well as when new."

"Every one of our 25 G-E 250-watt base station and 160 mobiles have delivered all the service we ever hoped to obtain."

". . . have never had a maintenance problem. One installation located 130 miles from the city needs only a routine monthly check."

"For obvious reasons we are continuing to purchase G-E equipment in our expansion program."

Deputy Director of Communications, New York City

IN OPEN BIDDING for communications equipment to guard New York City's critical up-state watershed areas and to add backbone to their municipal defense efforts G-E won on all counts. G. E.'s promise of dependable performance in any emergency *and* its reputation for maintenance economy were outstanding. Today, those promises are facts thoroughly respected and appreciated by New York's officials.

Take note of these facts and the growing preference for G-E! Examine the communication element of *your* defense preparations. The CAS* man in a local General Electric office will help you evaluate its strength. Call him today, or mail the attached coupon!

**2-WAY MOBILE RADIO*Communications Advisory Service*

GENERAL ELECTRIC

General Electric Company, Section X5544
Electronics Park, Syracuse, N. Y.

Please have a G-E CAS* man call with complete information on General Electric 2-way radio equipment for civil defense.

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Thousands of feet of Vitrified Clay Pipe sewers are being installed to serve many aircraft defense workers who live in this Santa Monica, Calif., residential area. The project is being handled by contractors N. J. Tomovich and J. P. Evans.

Wherever There's Expansion . . . Clay Pipe is *first choice for SAFE SEWERAGE!*

Ask the officials and engineers of almost any expanding locality, and they will tell you that Vitrified Clay Pipe is the *first-choice sewerage material* to meet the requirements of growing areas.

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● CLEANING up after Vicksburg's tornado. Photo from Caterpillar; drawing above by Pousette-Dart.

CIVIL DEFENSE *and Natural Disasters*

"Thirty-three states and five territories have provided that civil defense within those states and territories shall be responsible for relief in case of natural disaster" said Val D. Peterson, Administrator of the Federal Civil Defense Administration at the APWA meeting in New Orleans last fall. He continued: "Since I have been civil defense administrator, since March of this year (1953), we have had nine of these major disasters to deal with. We have had tornadoes, and a tremendous flood in Sioux City, Ia., floods in other areas and a forest fire in New Hampshire. We have had a tornado in Waco, Texas, which was followed by a terrific tornado in Flint, Mich., which killed in the neighborhood of 100 people and put seven or eight hundred in the hospital in a matter of minutes; and another one in the city of Worcester, Mass., that killed around 100 and put another seven or eight hundred in the hospital. . . .

"I say that the only pleasant thing about my job is this: That as we prepare America for a possible atomic attack we are also preparing America for relief of natural disasters that experience teaches us we can expect in some of our communities year after year."

Transportation *in Disasters and Emergencies*

NO street system in any city is capable of handling all the traffic that would be imposed on it by an enemy attack or by any major catastrophe if everyone were permitted to use that system when, as and if they desire. Vehicular travel must be curtailed. It is necessary, therefore, to plan procedures that will prevent clogging of streets and highways to a degree that will interfere with, or prevent, rescue and rehabilitation. This will require good advance planning and training, and a good public information program. The material that follows covers procedures found most helpful in such planning and programming. It is based largely on the data in the excellent booklet by the FCDA, TM-13-1, The Utilization and Control of Streets and Highways in Civil Defense Emergencies.

Such planning is an endeavor requiring the full cooperation of many services of the state and local civil defense organizations. For instance, the traffic engineer prepares the basic traffic circulation plan, consulting with the police services in regard to control and to operation. He relies on the transportation services for advice concerning the number, type and movement of mass-transit vehicles. He integrates the plan with emergency welfare and coordinates it with the military to provide for their essential movements in an emergency.

● **HOW New York State marks its highways reserved for military and CD vehicles.**

The great value of mechanized transportation lies in its mobility, permitting its use for rescue, fire-fighting, repair and maintenance. Mobility, however, is dependent upon streets and highways as well as on vehicles. The advantages of mechanized transportation will be totally lost unless emergency vehicles can reach the scene of disaster. If immobilized by congested streets or highways, they are useless. Therefore, complete denial of the use of any or all streets and highways to unauthorized traffic may be required; but this is such a drastic measure that it cannot be effected without a vast amount of preliminary organization, training and education.

In addition to planning for the curtailment and complete control of traffic, other preparatory measures include the development of plans for circulation, regulation and control of emergency traffic by both state and local officials. In this phase of the planning, the statutes and ordinances of every political jurisdiction should be reviewed with the object of determining and enacting such legislation as may be required for the carrying out of the needed plans for maximum highway utilization in an emergency.

State Control—Participation by state engineering services in the traffic control program should include the following:

(1) Selection of a state-wide network of emergency routes preferably separate for mobile support and evacuation in cooperation with the civil defense services. A satisfactory network should link all cities and communities which will participate in a mutual aid and support program. Routes should permit rapid movement of a large volume of traffic with a minimum of policing. Roadways and, more particularly, bridges must be capable of supporting heavy loads and have sufficient clearance for oversized vehicles and equipment.

(2) Identifying these emergency routes to the general public and furnishing maps showing their location to all concerned with this phase of civil defense. Civil defense officials must know these routes so that plans may be made for care of evacuees, for maintaining and policing the route and for traffic regulation. Mutual aid support participants and the military need to know the routes they must follow. The general public, as a part of the education program should be informed of the routes from which they will be excluded.

(3) Cooperating with transportation and police services in developing a plan for regulating and controlling traffic on the emergency network during disaster periods. The degree of required traffic control will vary almost directly with the distance from the disaster. Within the immediate vicinity of the disaster area very rigid traffic control will be required and every crossing of the emergency highway network should be blocked and manned or otherwise controlled. Highway traffic regulation posts must be established on all important routes, and especially at locations that will afford bypasses or other means for diverting traffic. A large area of vacant land for parking purposes is desirable near at hand to such posts.

Local Control—Traffic control problems in a stricken city will be more severe, and planning must be detailed and flexible, with provision for alternate routes for every main route that may be unusable. Streets most likely to be usable should be chosen on the following basis: (a) The traffic to be served, for instance the requirements and clearances for cranes, fire apparatus and heavy construction equipment. (b) Probable immunity to physical damage, flooding, heavy accumulations of debris and similar factors. (c) Ease of control by police forces. Potential bottlenecks of every type should be avoided or steps taken to eliminate, during disaster periods, the factors that cause such clogging.

Execution—Properly planned and executed, the emergency street system should operate as if composed of long sections of controlled access routes, except for damaged areas which may not be foreseen but for which alternate plans should be provided, no matter what the location of the center of damage.

Traffic Control—The plan for maintaining a clear right-of-way for emergency vehicles should contemplate complete exclusion of all unauthorized traffic—that is all traffic not required to carry out the plans for fire fighting, rescue and repair and maintenance. The prin-

● **OVERFLOWING river leaves city streets covered with mud.**

Table 1—Clearing in Lineal Feet Per Hour for 10-Ft. Widths with Turnouts 300 Feet Apart

Equipment Item	Average Depth of Debris in Inches					
	6	12	24	36	48	60
Sweepers following plows	3,000	...	...	...	...	...
Sanitary Trucks with plows	400	200	...	...	...	...
Snow plows	2,000	300	...	...	...	...
Motor graders	5,000	100	50	...	...	...
Draglines	...	100	50	...	...	...
Front-end loaders	200	100	50	...	...	...
Bulldozers and tractors	1,000	600	300	200	150	100
Crane and bucket	...	200	100	75	50	30
Power shovel	...	200	200	150	100	75

cipal problems are likely to be: (a) Disposing of traffic already on the emergency street system. (b) Improvising temporary emergency routes in areas where the preselected routes are impassable. (c) Maintaining a clear right-of-way for emergency vehicles. (d) Controlling the flow of traffic into the city. This means the exclusion of unauthorized or unnecessary vehicles and the routing, through control points, of mobile supporting vehicles and personnel to the affected area by the best possible means.

In support area communities, the problem of traffic control will vary with the distance from the scene of disaster. Those cities near at hand must provide for the movement of their own support vehicles and also for the passage through their streets of support vehicles from cities more distant. These conditions will affect the degree of restriction placed on other than emergency or support vehicles. Those communities near the area affected by the disaster must also divert unnecessary traffic and see that it does not add to the confusion and congestion that already exists.

Public Information—While the traffic circulation and control plan is being developed, a public information program should be initiated, care being taken that the information released is clear and easily understood and appreciated; and, most important, that such a sound program has been developed prior to the release of any information that subsequent changes which may result in public confusion are entirely avoided.

What One State Has Done

Here is a brief outline of some of the steps that have been taken by the New York State Department of Public Works in preparation for disasters and emergencies.

The plan is based on the premise that, since no community has enough equipment for prompt clearing of debris and wreckage from traffic arteries if serious disaster strikes, borrowing from the neighbors is necessary. Moreover, disasters usually come without warning, so clear-cut and definite plans for cooperation must be made ahead of time or confusion will result and repair and rescue work will be seriously delayed.

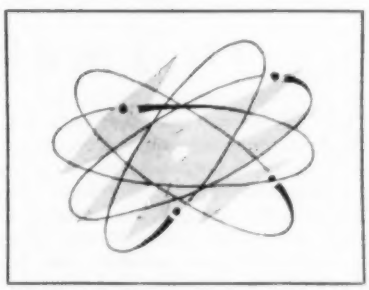
Working on a state-wide basis, New York has taken inventories of the road and construction machinery available in the various political subdivisions. Equipment is listed as "units" with the necessary manpower and subsidiary equipment for efficient operation. For instance, Unit A is a bulldozer and tractor combination; Unit B is a motor grader and Unit C is a crane or clamshell. The inventories are kept up to date and estimates have been made, as shown in the accompanying table, of the kind and amount of work that each unit is best suited for and what it can do. Also plans have been developed so that local organizations know where the equipment is to move in case of disaster when the signal, transmitted through the State Civil Defense organization, is given. Movement in response to the signal is automatic and based on previously adopted plans.

Not all equipment in an area is intended to be put into service initially. The plan provides that some of it will be held as a reserve for unusual or unexpected contingencies, or for concentration where a special need exists, or after there is time to assay all aspects of the disaster.

Specific main traffic arteries have been designated to be closed to all but civil defense and official traffic. When a disaster occurs, one of the first activities will be to set up road blocks and clear these roads of all but essential traffic. Incoming equipment will report to control points from which it will be dispatched to the needed areas by the best available traffic routes. Equipment will not travel in convoys, which tends to increase traffic congestion, but as individual units.

A-B-C of RADIATION HAZARDS

RADIATION hazards are closely associated with our search for new power sources and the concepts of warfare in this atomic age. Because of the dangers inherent in uncontrolled radiation, it is of great importance for all public officials, particularly those concerned with civil defense activities, to have a working knowledge of the fundamental nature of radioactivity and with the terminology used to describe the radioactive phenomena.



Radioactivity is that property of certain substances which is characterized by spontaneous disintegration or decay due to the instability of their atomic structures. These disintegrations are accompanied by the emission of alpha and beta particles, gamma rays and other subatomic particles. Most of the energy released by the disintegration of radioactive materials is accounted

for by *alpha particles*, which are helium nuclei stripped of their outer electrons. Alpha particles have relatively low penetrating power; thus they are absorbed by the outer layer of skin and are easily stopped by any shield, even a sheet of paper.

Beta particles emitted by radioactive materials are high speed free electrons. Their density is much less than that of the alpha particle and consequently they have a somewhat greater penetrating power. However, they are absorbed by a few centimeters of body tissue and protection against them is afforded by thin sheets of aluminum, glass or plastic.

Gamma rays are high energy electromatic radiations similar to cosmic rays (also high energy) and X-rays (low energy). Gamma rays will penetrate all but the most dense shielding materials, and thick lead or concrete walls must be used for protection.

Radioactive materials may occur naturally or they may be created synthetically. Uranium and radium are examples of such materials found in nature. In addition, hundreds of radioactive isotopes, often called radioisotopes, of various elements have been produced artificially in the laboratory and by atomic explosions.

The Half-Life—Each isotope decays at a fixed rate which is measured by its half-life, that is, the time required for one-half of the parent material to decay. This rate is a constant for each radioisotope and cannot be changed by any available means. Radioactive decay follows an exponential curve; at the end of the half-life period, one half of the original material remains; after twice this period, one quarter of the material remains, and so on. Thus the radioactive material is never completely destroyed, but as times goes on its activity approaches the low level which is present in all objects. Half-life durations vary from a fraction of a second to many thousands of years. Obviously, the radioisotopes chosen for medical purposes and industrial research are usually ones which lose most of their radioactivity within a reasonable period of time.

Radiation Hazards

Radiations emitted by radioactive materials ionize the materials they strike by disrupting electrons. Bodily changes produced by exposure to radiation include burn, depilation, blood production disorders, cancer and genetic effects. Though damage may be brought about by either external or internal exposure, it is apparent that the gamma rays present the greatest external danger because of their penetrating power, while the alpha and beta particles are most hazardous if ingested through their presence in food or water mixed with dusts which may be inhaled. In particular, radioisotopes of those elements which are components of the bone structure of the body are likely to cause damage if ingested since they are likely to become fixed in the bone tissue from which they will be eliminated very slowly.

Units of Measurement

Not many years ago, radium was the most widely used radioactive element, and basic units of radioactivity were related to a given weight of radium. Thus the *curie* is defined as "that quantity of a decay product of radium which has the same disintegration rate as a gram of radium, or that has the same number of atoms disintegrating per unit time as one gram of radium". This value is generally accepted as 3.7×10^{10} disintegrations per second. The *millicurie*, which is one-thousandth of a curie, and the *microcurie*, which is one-millionth of a curie, are other widely used units for expressing quantities of radioactive material. It should be noted that the definition of a curie is related to the decay products of radium, which have simple decay schemes. When dealing with radioisotopes of other elements, measurements of radioactivity in terms of curies may lead to error due to their more complex disintegration schemes.

More important than units expressing quantities of radioactive materials are those expressing units of radiation dose. The *roentgen* is such a quantity of radiation, and is defined as the amount of gamma radiation which will produce 1 electrostatic unit of charge per cubic centimeter of air. One electrostatic unit of charge is roughly equivalent to 2×10^9 ion pairs. Since it is the ionization (or ion pairs) produced in tissue subjected to radiation which causes bodily damage, it will be seen that the roentgen becomes a convenient unit for measuring radiation dosage. Radiation rates are measured in roentgens per unit time; total dosage is determined by multiplying the radiation rate by the time of exposure.

Permissible Exposure

On the basis of experience with the use of X-rays in hospitals, radiologists have considered 0.1 roentgen as the maximum permissible daily exposure. With the development of the atomic energy program where gamma radiations of great penetrating power are encountered, the permissible limit of exposure has been reduced to 0.05 roentgens per day, or a total of 0.5 roentgens per week.

The roentgen is limited by definition to measurement of X-ray or gamma radiation, and it is necessary to use some other unit to express ionization in tissue produced by alpha and beta particles and by neutrons and protons. This unit is called the *roentgen-equivalent-physical* (or "rep") and is the amount of radiation which produces the same amount of ionization in tissue as one roentgen will produce in air.

One other factor is involved in the measurement of biological damage incurred by radiations because of the varying degree with which the energy of different ionizing radiations is absorbed by bodily tissue. To adjust for these differences, the *roentgen-equivalent-man* (or "rem") is used. Extensive experimental studies have indicated that the biological effect of alpha rays may be 20 times as damaging as an equal rep dosage of beta rays.

PROVIDING SAFE WATER IN EMERGENCIES

BECAUSE water is necessary for drinking purposes and for firefighting, and because it can carry the causative agents of many diseases, water supply and procurement are of vital importance. The following data are based in part on notes dealing with civil defense and water supplies which were furnished by the FCDA which recommends a three-phase overall program:

First Phase—(1) Formulate the over-all defense plan for the water works, establish a chain of command in the water defense organization

Courtesy General Electric Co.

● **TWO-WAY radio speeds field work in determinations of water condition.**

and integrate the water plan with the local civil defense plan. (2) Train and screen employees for security (not normally necessary in the smaller plants); designate shelter areas. (3) Make a pre-disaster survey and study the water works to discover existing weaknesses and to locate auxiliary sources, extending the study beyond the city limits to include suburban areas. (4) Look well into the maps and records of the system to determine what missing information must be supplied if men not personally familiar with the system are to work on it. (5) Prepare a training program covering repair crews, emergency chlorination and other treatment measures, laying lightweight pipe and doing the other things that the overall plan may indicate as needed. (6) Prepare a water sampling plan for emergencies and train personnel in detection and removal of impurities.

Second Phase—This phase should provide necessary construction and improvements to: (1) Provide better fire protection. (2) Insure adequate emergency communications facilities. (3) Maintain a suitable inventory of construction and replacement parts and equipment. (4) Install such protective devices as automatic residual chlorine equipment.

Third Phase—This part of the program should see the activation of the civil defense water works plan. Depending upon the imminency of actual war, it should include: (1) Acceleration of the work started in the first two phases of the program. (2) Initiation of suitable security measures and regulations. (3) Construction of shelters and other necessary facilities for safeguarding the plant and its employees. (4) Increasing chlorine residuals and increasing the sampling program.

Records of The System

Probably the first step that will be needed will be that of bringing up to date the maps and records of the water utility system. Accurate maps and records are a necessity for quick repair of breaks, for prevention of excessive water loss, for adequate fire-fighting and for control of quality.

On another page of this issue is an article telling of the experiences in Mobile, Ala., encountered in trying to bring the distribution system records up to date. In next month's issue will be a comprehensive article on the "Public Health Aspects of Water Plants and Systems." Both these articles supplement this one and apply to civil defense, disasters and everyday operation.

Weaknesses and deficiencies exist in every water system, and the pre-disaster survey should endeavor to locate these, for many of them will not appear in any records of the department. Among the items to look for are possible bottlenecks to fire flows, possible auxiliary sources of water and the equipment needed to utilize them, the adequacy of storage, the need for standby power and for duplicate or additional chlorinating equipment and the adequacy of laboratory facilities.

Quantity of Water

The quantity of water that will be needed immediately after a disaster needs careful study and consideration. Water for fighting fires will demand a high priority in time and a great deal in quantity. The need for drinking water will quickly become urgent, so priority also must be given to a supply of safe water. It is desirable to set up in the plan provisions for specific minimum quantities of water, which may be as follows:

(a) At least five gallons of potable water per casualty to be delivered within three hours after the disaster to all hospitals and first aid stations; and increase in this quantity to 10 to 15 gallons per day per casualty within 12 hours. (b) At least 5 gallons per evacuee (or others in mass care centers) within 10 to 12 hours, with an increase to 10 or 15 gallons within 24 hours. (c) Restoration of potable water service to sections of the distribution system which have not been damaged within 24 to 72 hours. In addition, provision may have to be made for water distribution to areas where there has been damage to the distribution system. In general, the same provisions as in (b) above should apply here—at least 5 gallons per person within 10 to 12 hours, and more later—but every effort should be made to reduce the time limit to 6 hours. This may require provision for retail distribution of water, which is a difficult problem. In general, the use of water points should be avoided if it is at all possible to do so; but, nevertheless, plans should contemplate a prompt and certain provision of water for these areas, no matter what method is to be used.

Contamination

The importance of radiological warfare agents, so far as water contamination is concerned, has been over-emphasized. The amount of radioactive material which can be consumed in drinking water without harmful effect has been determined for 10-day and 30-day periods. The likelihood that the water supply may be contaminated to the extent that it will cause illness or danger of permanent damage to water users is not great, but it will vary from place to place, depending on many local conditions.

Chemical agents are potentially dangerous, but more so to small groups than to the general population. It would be relatively easy to contaminate a small portion of a distribution system, but the actual damage from an overall viewpoint would be negligible. Conversely, it would be most difficult to endanger the quality of an entire water supply, or of any large portion of it—certainly if the water department direction has done its job properly as outlined briefly here and in much more detail in FCDA TM-13-2, "Operation and Repair of Water Facilities in Civil Defense Emergencies." The same is generally true of biological and bacteriological contamination. Much study was given to this subject during World War II, with the conclusion stated earlier in this paragraph. There have been some changes in the picture since that time, but it is believed that none are significant. The best protection against chemical, biological and bacteriological warfare is still a properly designed, constructed, equipped and operated water system; and if this is provided, the opportunity for damage or danger to health is limited.

Some Stockpiled Material

The FCDA has stockpiled certain items for civil defense use. We have at hand TB-13-2, covering utilization of FCDA stockpiled portable generator sets. This bulletin describes the sets and gives a lot of information on their selection for specific jobs, applicability and use. TB-13-5 covers utilization of stockpiled lightweight steel pipe and centrifugal pumps, describing the equipment, method of use, method of laying pipe and making joints, and giving much additional data.

INSECT and RODENT CONTROL in LOCAL DISASTER PLANNING

LOUIS B. READ
Biologist,
City Health Dept., Dallas, Texas

OUR vector control program is designed as an integral part of the overall disaster and civil defense set-up in Dallas county. It is a part of the environmental health phase of disaster planning headed by H. E. Drumwright, sanitary engineer and chief of environmental sanitation services in the City Health Department.

We have adequate reason to be concerned about vector control in Dallas. Normally, we have a real and considerable problem in the environmental and mechanical control of certain species of our mosquito and rodent population. Aside from the nuisance value of some species of mosquitoes (there are 21 species of record in Dallas county), at least three species, *Culex tarsalis, Anopheles quadrimaculatus,* and *Aedes aegypti* are known to be disease vectors. All three of these are fairly widespread in Dallas. Besides the mosquitoes, we have at least fourteen species of houseflies, blowflies, stableflies, etc., which could erupt into a real public health menace in the absence of controlling factors. Besides these we have our share of rats completely equipped with Asiatic rat fleas and an endemic typhus infection in reservoir status. There are, of course, other arthropods that are potentially dangerous (i.e. Psychodid flies, the bloodsucking bug *Triatoma*, ticks, mites, etc.), and the possibility of introduction of exotic pathogens and arthropod vectors in the event of biological warfare should not be completely ignored. Our assumption in disaster planning is that some vector-borne diseases may attain epidemic proportions in the event of a major disaster.

Planning Bases

For purposes of planning we make several other assumptions: for instance, that weather and other environmental conditions will be optimal for all types of vectors at time of disaster occurrence. It is also assumed that a fire hazard may be attendant to a disaster and that our chemical repertoire must lean heavily toward the use of water emulsions from concentrates, and upon technical powders and aqueous suspensions of wettable materials. Another fundamental assumption is that we will have to do a considerable amount of disinfecting and odor control work as well as vector control, at least in the event of widespread disaster.

In view of these and other considerations, it was decided that our area would best be served by several self-contained, highly mobile, and well trained vector control units in outlying sectors of the city. Each unit is therefore a part of a completely autonomous environmental health unit which could function independently of the central headquarters if necessary. Since city-owned equipment and city personnel would be inadequate to man these vector units, the members of the Dallas Pest Control Association have gone on record as volunteering their services and equipment for disaster purposes. The volunteers are assigned a sector station to which they will report immediately. There they

(*Continued on page* 114)

● **DALLAS truck-mounted fog dispensing unit at work.**

● **METHOXYCHLOR controls mosquito larvae and pupae.**

Guy Browning Arthur

BIOFILTRATION Serves a GROWING CITY

GROUND was broken in Beaumont, Texas, on January 11 of this year for a 30 MGD sewage treatment plant in which new elements are introduced. It will be the only plant, except for New York City, where two lines of sludge are mixed in calculated proportions to accelerate thickening. Manifolding of sludge lines is not new, but it is employed here to an unusual extent to permit pumping of sludge in any direction. And the use of only two digestion tanks, one heated and the other un-heated, where four would normally be built for a plant of this size, will be watched with increasing interest by many engineers.

A contract for the construction of the plant, to cost $2,387,000, was let to the Tellepsen Construction Company, of Houston. This money is part of $6,500,000 voted by the city for a complete sanitary sewer improvement program. Work on the collector system has been in progress for a year. The plant and collector system were designed by George J. Schaumburg, consulting engineer of Beaumont. Forest & Cotton, Dallas, were engineering consultants. To have everything ready for the contractor when the award was made, the city purchased all equipment in advance.

Beaumont is on the Neches River, on the eastern border of Texas. Its remarkable growth is the product of rapid oil development, plus the construction of a ship channel from the Gulf of Mexico to the heart of the city where there are extensive docking facilities. It is so close to the Gulf that any calculations for the use of the river must take considerable tide into account.

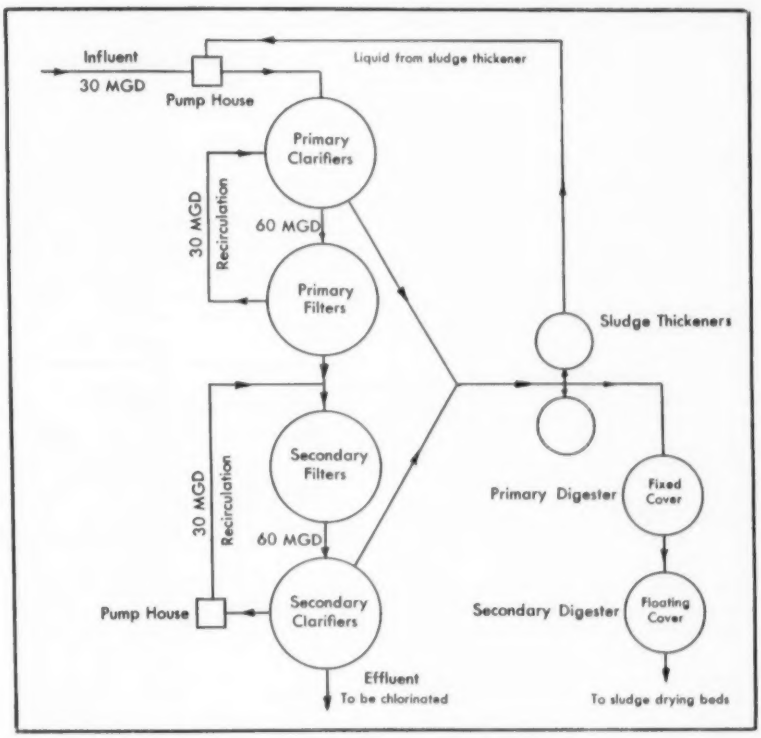
This growth in population is comparable in trend to that of five other important Texas cities. None of the others can boast an expansion in area equal to that in Beaumont. In 1946, when its corporate area was 6000 acres it annexed more than twice that much land, and suddenly covered 20,000 acres. Continued growth must be anticipated, and the estimates in Table 1 were used for the design of the sewage treatment plant:

The location of the treatment plant within Beaumont is not important except to show that the city was originally laid out on a bluff along the river, and that expansion had to be westward, going down hill toward Hellebrandt Bayou and other natural drainage lines. This reversed the original plans, which used outfall lines to the Neches River, and in the comprehensive reconstruction of the collector system the lines must be laid to flow to the west and south. Therefore the new plant is located on the southern border of the city to receive raw sewage flowing by gravity through the new mains.

This provides an excellent disposition of the effluent into Hellebrandt Bayou. The rice growers, who pump water from the bayou for irrigation, welcome an expected increase in fertilizing elements which this effluent will add for their plantations.

TABLE I—DESIGN DATA FOR BEAUMONT PLANT

Year	Population	Sewage Flow in Mgd		
		Minimum	Average	Maximum
1955	110,000	13.4	19.6	42.3
1960	135,000	14.9	22.4	46.0
1965	168,000	16.8	25.9	50.9
1970	200,000	19.4	29.9	56.2



● **FLOW sheet of Beaumont's new plant showing method of recirculation used for this 30-MGD two stage installation. There are four 195-ft. filters.**

Analyses of samples from seven points in the present collector system vary greatly. The high counts are in an outfall line to the river, and a ditch, in both of which there is stagnant flow. For BOD the count ranges from 48 to 1020; for total suspended solids from 98 to 1240; and for pH from 6.4 to 7.3. In the studies made to determine a plan of improvement the city was faced with national and state reports that the water of the river and the nearby bayous was becoming dangerous to all forms of aquatic life, a condition which cannot be tolerated by

these authorities, or by the fishing industries.

In his report to the city in December 1952, George J. Schaumburg, consulting engineer, analyzed existing conditions with consummate care, and added a thorough discussion of processes for treating sewage. His recommendation to adopt the trickling filter process was accepted, and the plant has been designed to make maximum use of the advantages of this method.

The flow chart streamlines the complicated layout of the construction plans, and picks out the important elements of the design. Incoming sewage reaches the pump house, through the grills and grinders, with an average flow of 30 MGD, and is lifted through a diversion center to four primary clarifiers with 155 ft. inside diameter and about 8½ ft. sidewater depth. Next in the line are two primary and two secondary filters, each 195 ft. inside diameter. Four final clarifiers with the same inside diameter as the primary tanks complete the major line of flow.

Sludge from both sets of clarifiers goes to two thickeners 50 ft. inside diameter and 8 ft. 10 ins. effective depth; and from these to two digester tanks 80 ft. in diameter and 24 ft. sidewater depth. The primary digester is heated, and has a fixed cover. The other is un-heated, and has a floating cover. Sludge is pumped from these digesters to the drying beds.

Sludge enters the thickeners with 2½ percent solids. The Dorr Company has guaranteed that sludge from the primary and final clarifiers can be mixed and thickened in these units to 7½ percent solids. It is expected that this thickening can proceed beyond this concentration; and it may be limited only by ability to move sludge of the resulting consistency to the digesters.

The important feature in the operation of the plant is the recirculation of sewage. A volume of 60 MGD is maintained at all times in the main line from primary to final clarifiers, though the normal flow of sewage into the plant is only half that amount. This is accomplished by two cycles of recirculation. The first cycle comes by drawing off 30 MGD of sewage from the primary filters and returning it to the primary clarifiers. A second cycle of recirculation is on the far side of the primary filters. Here only 30 MGD are flowing from the primary filters, since the other 30 MGD have been returned to the primary clarifiers. This outflow is doubled by bringing in an equal amount from the finishing clarifiers to maintain the 60 MGD flow in the straight-line circulation.

This plan of operation is at an optimum when it is using the present, or base volume, of 30 MGD of influent. As the incoming volume of sewage increases beyond 30 MGD, the balance between influent volume and recirculated volume is gradually lost. At 60 MGD the recirculating pumps will be cut off, and will serve only to move sewage in the conventional manner. At this maximum the whole plant reverts to a conventional type, with the recirculation feature eliminated. As shown in the foregoing table this 60 MGD volume is expected about 20 years from the beginning of operation.

Quantities and Calculations

Some of the details as to sizes and quantities in the equipment, and a few calculations, are worth attention. The four main lift pumps are Fairbanks-Morse vertical Angleflow type. Two are 10, one is 15, and the other is 20 MGD. The primary clarifiers with a detention period of 1 hour and 59 minutes have an overflow rate of 790 gallons per sq. ft. per day.

Both sets of filters, with an average stone depth of 4 ft. on an area of 29,800 sq.ft. will use 4410 cu.yds. of rock per unit. On a basis of BOD load of 0.17 pound per capita, and the ultimate of 200,000 population, there will be 34,000 lbs. of BOD coming per day to the primary clarifiers, and 22,100 lbs. of BOD to the filters.

The primary and secondary digestion tanks have a total capacity for the two of 255,500 cu.ft. Area of the sludge drying beds is 210,000 sq.ft.

Chlorination will be used only to disinfect the final effluent. Based on a design flow of 30 MGD the chlorine can be dosed at 10 parts per million. Chlorinating equipment is supplied by Wallace and Tiernan, and is of the air-operated Vacuum Master Type.

The size of the detritor was determined by the area method. On a maximum flow of 60 MGD and a grit-removal size of 0.2 mm and larger, with a settling rate of 16.2 seconds per foot, the chamber should have an area of 1505 sq.ft., and the basin is therefore 40 ft. x 40 ft.

Equipment

The secondary sludge pumps are vertical, close-coupled turbine style, supplied by Peerless. They have a capacity of 550 GPM against a head of 25 ft. Peerless also supplied the two 80-GPM pumps for the plant water system. All sprinkling equipment items were supplied by Buckner Mfg. Co. Bar screens were furnished by Link-Belt Company. These are complete with Electrofluid drive and Flexoplus timer. This company also furnished two No. 1 Gruendler shredders with 15-HP motor drive.

The Dorr Company furnished the Detritor; 4 primary and 4 secondary clarifier mechanisms; 4 distributors; 2 thickeners; 6 sludge pumps; and the digester equipment.

• • •

Radios on Maintainers Make Up to $25 per Day

Shortwave transmitters and receivers have been installed by Hardrives Construction Co., Fort Lauderdale, Fla., in three Huber maintainers, three pickup trucks, three dump trucks and two cars. The set used is GE ultra high frequency and the range is 22 to 25 miles from the base set or 8 to 10 miles from mobile unit to mobile unit. The Hardrives Co. reports the cost (in The Huber News) at about $6000 for the installation and states that there is a saving on the use of the maintainers of $20 to $25 per day, resulting from their increased efficiency.

• • •

Information Wanted on Landslides

The Committee on Landslide Investigations, Highway Research Board, requests help in compiling a volume on "Landslides and Engineering Practice." The questionnaire covers all phases of the subject from economics to prevention and correction of slides. The committee earnestly requests additional facts from all engineers and geologists, whether they have data on one or many slides and whether their information is general or specific. Requests for copies should be addressed to Seward E. Horner, Chief Geologist, State Highway Commission of Kansas, Topeka, Kans.

11 Texas Cities Join in GIANT PIPELINE and DAM PROJECT

B. H. CRUCE,
City Manager, Pampa, Texas

THERE is a saying among West Texans that when Noah got his flood West Texas got a half-inch rain.

The need for more water in the Texas Panhandle Plains region was spotlighted in 1953 when President Eisenhower and six state governors met in Amarillo, Texas, to discuss the needs of the drought stricken farmers and ranchers of the southwestern United States.

For a number of years, this region of Texas has been watching its underground water supply decline each year. Farmers, ranchers and city dwellers all have been trying to find a solution to the problem of an ever increasing demand on the constantly decreasing supply. The number of irrigation wells in the region increased from less than 1000 ten years ago to over 20,000 today. The urban population during the same period has almost doubled.

Farsighted men such as L. R. Hagy, former mayor of Amarillo, C. A. Huff, former mayor of Pampa and A. A. Meredith, former city manager of Borger proposed damming the Canadian River, the only river that crosses the Texas Panhandle, thus storing surplus flood waters for domestic, industrial and municipal uses for the cities in the area.

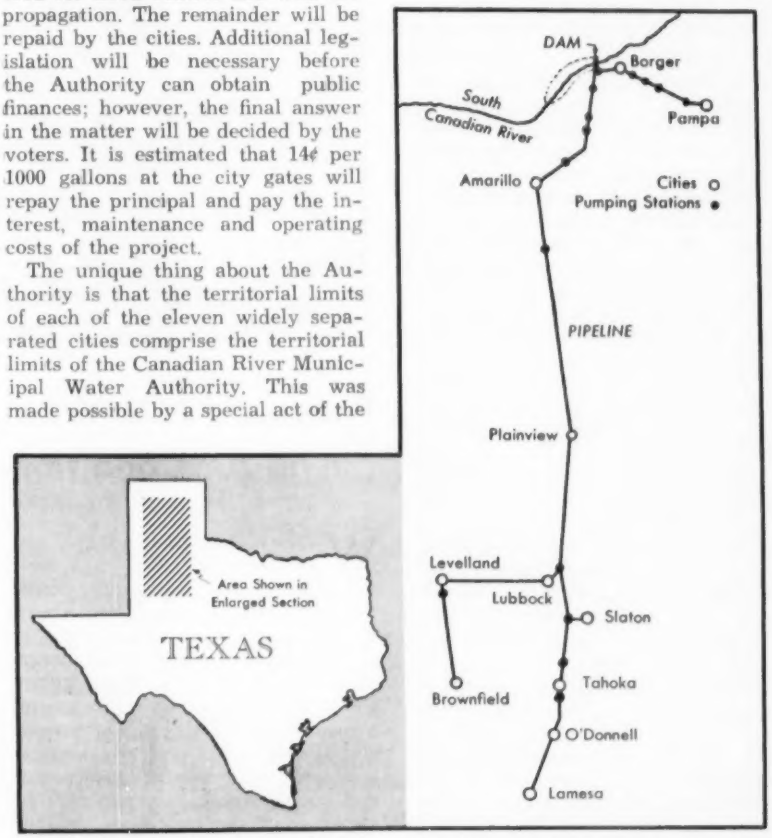
Several citizens went to Washington in 1950 and were successful in obtaining legislation authorizing the dam although no appropriation for its construction was made. Congress later appropriated money for the Bureau of Reclamation to make a study of the feasibility of the dam and pipeline system. The Bureau made a report in which it recognized the feasibility of the project at an approximate cost of $85,000,000.

The twelve cities originally involved were Borger, Pampa, Amarillo, Plainview, Lubbock, Tahoka, O'Donnell, Lamesa, Slaton, Levelland, Littlefield and Brownfield. However, at the confirmation election of the Canadian River Municipal Water Authority on November 24, 1953, Littlefield voted to stay out of the Authority. The other eleven cities are carrying on the project. Their next step is to find funds from some source and to bring a proposition before voters in the district for confirmation.

There is considerable discussion among the sponsors as to whether the project should be constructed with private or public finances. They hope the Federal government will aid in that part of the cost considered for flood control and wild life propagation. The remainder will be repaid by the cities. Additional legislation will be necessary before the Authority can obtain public finances; however, the final answer in the matter will be decided by the voters. It is estimated that 14¢ per 1000 gallons at the city gates will repay the principal and pay the interest, maintenance and operating costs of the project.

The unique thing about the Authority is that the territorial limits of each of the eleven widely separated cities comprise the territorial limits of the Canadian River Municipal Water Authority. This was made possible by a special act of the Texas Legislature allowing each city to be represented on the Board of Directors. The directors, a total of 17, are appointed by the governing bodies of the eleven cities. Cities with over 10,000 population have two directors and cities under 10,000 have only one director on the board. C. A. Huff of Pampa is president and A. A. Meridith of Borger is secretary-treasurer of the new organization.

The Canadian River heads in New Mexico, flows across the Texas Panhandle into Oklahoma where it joins the Arkansas River. The water rights of the river have been determined by compact ratified by the



● TEXAS Panhandle water problems may be solved by pipe line 215 miles long, with 135 miles of branches, taking water from new dam on S. Canadian River.

three state governments and confirmed by the United States Congress. The Texas water rights, 140,000 acre-feet annually, now belong to the eleven cities.

The proposed dam will be built ten miles west of Borger or approximately 45 miles northeast of Amarillo. The reservoir planned by the Bureau of Reclamation will have a total controlled capacity of 1,375,000 acre-feet, allocated as follows: Sedimentation, 450,000 acre-feet; conservation, 500,000 acre-feet; and flood control, 425,000 acre-feet.

In addition to the above, the reservoir will have 630,000 acre-feet of super storage, or uncontrolled capacity, to protect the dam during periods of extremely large floods and to provide the most economical design.

The sedimentation capacity is estimated to last 50 years. The life of the reservoir, however, could be 100 years by using the uncontrolled storage capacity, some of the flood control storage capacity and perhaps enlarging the spillway.

The dam as proposed would be approximately 7,200 feet long, 40 feet wide at the top and 190 feet high. It will be a rolled earth fill structure. The water surface of the reservoir will be about 21,000 acres for the controlled capacity, increased to 26,000 acres when filled to total capacity.

Provisions will be made to keep the oil and gas wells in the reservoir area in operation.

A pipeline system is planned to supply the water from the reservoir to the cities of the Authority. The present plans are to start the pipeline with an 84-inch pipe at the reservoir and end it with a 24-inch pipe at Lamesa, 215 miles away. The total length of the pipelines serving all the cities will exceed 350 miles. The static lift from the proposed reservoir to Amarillo, the highest point, is 756 feet.

The 20,000 irrigation wells in the Panhandle area furnish approximately 2,500,000 acre-feet annually to farmers and ranchers. The water from the Canadian River will not be used for irrigation but it will lessen the demand upon the underground water for industrial and municipal purposes.

Many of the cities are short of municipal water. The two largest cities in the Panhandle, Lubbock and Amarillo, have purchased underground water rights 65 to 70 miles from their city limits. If the Canadian River project is completed within the next five to seven years, these underground water sources will not have to be developed for years to come, maybe never in the foreseeable future.

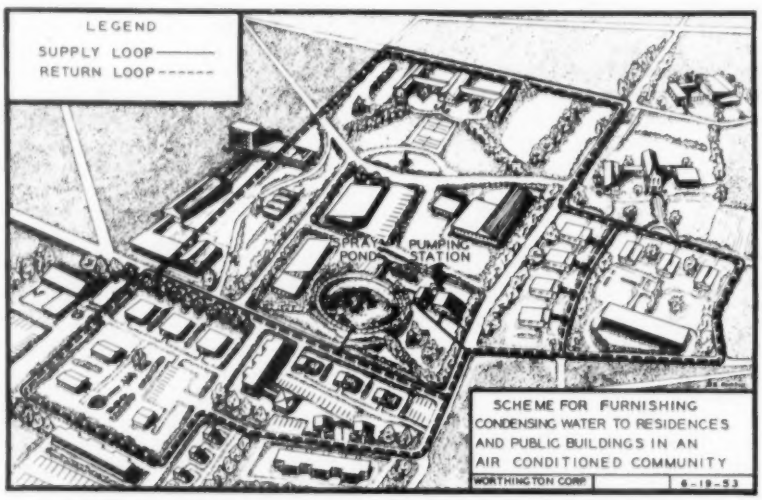
Although none of the estimated cost of the project includes recreational facilities, the reservoir will provide many opportunities for recreation, such as, picnic sites, camping, boating, fishing and many other outdoor sports.

Most strangers to the Southwest look upon the dry sand bed of the Canadian River and wonder from where will the water come should a dam ever be constructed. The river has a sand bottom that exceeds 190 feet in depth at the dam site; however, the water level in the sand is within a few feet of the top even during the southwest's driest periods. For months on end very little or no water flows on top of the sand, but at flood stage great quantities of water flow out of New Mexico and go unused to the sea.

According to the U. S. Geological Survey records over the past 20 years, an average of 400,000 acre-feet of water annually flows as flood water down the Canadian.

The future development of the entire Texas Panhandle and surrounding area requires this water if there is any way possible to hold and use it. The people of the region do not have a choice of rivers to dam, but must look to the Canadian as the only source of surface water which can aid in the support of the area's ever increasing population and industrial growth.

The Directors of the Authority hope to have a financial proposition to place before the voters of the eleven cities at the earliest possible date.



Proposed Plan Would Reduce Water Use in Air Conditioned Developments

WHEN it is desired to install air conditioning units in a development, water use requirements can be reduced by about 90 percent by following a plan proposed by M. M. Lawler, vice president in charge of air conditioning for Worthington Corp. The plan involves the use of a special recirculating piping system and a spray pond centrally located and made attractive by landscaping and architectural treatment. The water could be treated to inhibit corrosion, and the system could be drained in the winter. It is estimated that only one-tenth of the water normally used for air conditioners utilizing water cooled condensers would have to be taken from the local water department. Whereas a normal 3-ton air conditioner may require 1½ gallons per minute of cooling water per ton, or a total of 270 gpm, the proposed system would require only about 10 percent of this amount. The accompanying illustration shows a plan for supplying such water in new community developments where air conditioning is a factor.

AIRPORT
Runway Extension makes a Modern Field

Courtesy Fairchild Aerial Surveys, Inc.

● **GENERAL view of Blue Grass Field showing runways. The new runway extension is in the left center of picture.**

R. K. CLIFFORD,
Resident Engineer
for J. Stephen Watkins

A NEW $1,000,000 airport, Blue Grass Field, was proudly dedicated in the fall of 1946, by Lexington and Fayette County, Kentucky. The field had three concrete runways, hangar and a new adminis- 4000 feet long; all three were 150 feet wide. There were also taxiways, hangar and a new administration building. At first the airport was served by two commercial lines, Eastern and Delta; Piedmont has since been added, and there are now some 27 scheduled daily flights. In addition to the commercial airlines, there are charter flying services, flight instruction schools, and numerous privately-owned planes located at the Field.

With the continuing increase in air travel, larger commercial planes requiring more landing and takeoff space have been placed in service. An airport, in order to keep up with such developments, has to extend runways and expand other facilities. These expansions are costly, and most smaller fields must depend to some extent on outside financial aid such as federal grants or private donations for most of their development work.

At present federal aid is not easily available for airport work, but when the Lexington-Fayette County Airport Board decided to extend a runway, it was fortunate enough to obtain a federal grant of $50,000. This amount had to be matched by an equal sum from the Airport Board and the Commonwealth of Kentucky, with each of the latter contributing $25,000. In the fall of 1952, with $100,000 available, the Board retained the consulting engineering firm of J. Stephen Watkins of Lexington, Kentucky, to design and supervise the construction of a 1000-foot extension to the field's longest runway.

The engineers prepared construction plans and specifications for review and approval by the Airport Board, the Kentucky Department of Aeronautics and the Federal Civil Aeronautics Administration. This long-anticipated expansion had been well planned, for in the original construction extra land was available and was graded for a distance of 1500 feet beyond the end of the existing runway. Therefore, the principal work to be done consisted of excavating to the proper grade, placing the concrete runway pavement and installing electrical ducts for lighting circuits.

After field survey work and soil tests were completed, it was determined that the extended runway would be similar in design to the existing non-reinforced portland cement concrete, which was eight inches thick with no sub-base. The existing runway had not been doweled for future extension, so some means for tying the old and new slabs together for the transfer of stresses had to be devised. This was solved by designing an eight-inch sub-slab to be placed eighteen inches back under the end of the existing slab and installing dowels in this underlay which would tie it to the new pavement. When other preliminary problems had been ironed out, the plans were completed and approved. Competitive bids were taken in June, 1953. The low bid of approximately $76,000 was made by H. O. Wyse, General Contractor, of Lexington, Kentucky, with a unit price of $4.45 per square yard for the pavement.

The contractor set up his concrete batching plant near the end of the proposed runway extension and all materials were hauled to and stockpiled in that area. Batches were hauled to the paver by three trucks, each carrying two batches.

● **FIVE of the fifteen 10-ft. cement concrete lanes have been completed.**

This arrangement prevented loss of cement on windy days and spillage of one batch into another when dumping into the skip.

Mixing and placing was done with a 27-E Multifoot paver with a 20-foot boom, allowing the placement of concrete across lanes already poured but not aged enough to allow equipment on them. As the concrete was dumped, it was spread by mechanical vibrators and then finished by a Jaeger-Lakewood finishing machine with two screeds. Behind the finishing machine, the concrete was floated with a bull float, straightedged and belted. The final operation was the application of the membrane curing compound to the finished slab.

After the plant was set up, a trial concrete mix was designed and used in the eighteen-inch underlay strip at the junction of the old and new slabs. The trial mix quantities were as follows:

Cement 6 bags; mixing water 28.5 gals.; sand moisture 3 percent or 3.7 gals.; total water 32.2 gals.; fine sand 50 lbs.; sand 1030 lbs.; 1-in. to 2-in. aggregate 1053 lbs.; and 1-in. aggregate 1053 lbs.

The cement used was air entrained, which necessitated taking frequent air tests to control the percentage of entrained air, and also to compute the yield of the batch in bags of cement per cubic yard.

Moisture in the sand was checked daily. There was only one rainy day during the entire job, and it was found that the sand held a consistent moisture content of 3 percent. This percentage was converted to gallons of water and added to the mixing water to obtain the total water. The mixing water was varied as required to keep the slump between 1½ and 2½ inches.

The weight of the moisture in the sand was taken into consideration, thus increasing the total weight of sand added. Since the regular sand did not have enough fines, 50 pounds of a special blending sand were added to each batch. Equal amounts of #3 and #6 stone were used. The above-described mix was used throughout the entire job except for varying the mixing water to adjust the slump and the coarse sand to maintain the percentage of entrained air between 3 percent and 6 percent.

Air, slump and moisture tests were run regularly, and the results were used to control the quality of the concrete and to compute the yield of the mixture in bags of cement per cubic yard. The yield was kept between 5.9 and 6.1 bags per cubic yard. In addition, two test cylinders were taken in each ten-foot lane, one to be broken in seven days and the other in twenty-eight days. The seven-day cylinder tests averaged above 3000 pounds per square inch, and the twenty-eight-day cylinders averaged well above 4000 psi, with two of the latter testing above 5000 psi.

The runway extension was 150 feet in width and 1000 feet in length. Plans and specifications provided an option for placing the concrete in 10- or 20-foot lanes with longitudinal joints spaced 10 feet apart in either case. The Contractor elected to pour 10-foot lanes with the thought that it would be easier to cut a joint on the edge of each 10-foot lane than to cut a joint in the middle of a twenty-foot lane. All longitudinal joints were keyed and without dowel bars, except the outer two lanes on each side; these joints were doweled in order to prevent any lateral movement of the interior lanes.

Transverse joints were installed every twenty feet with dowel bars, and every seventh transverse joint was an expansion joint with dowel bars and ¾-in. x 8-in. premoulded bituminous filler. In case of breakdowns or when placing concrete was stopped, a keyed transverse joint with dowels was used as a construction joint.

Placement of the 16,700 square yards of concrete was started on August 10, 1953, and completed September 17, 1953, all of the work being done on a five-day week schedule. Only two days were lost during this period due to breakdowns and rain. The temperature remained in the upper nineties during most of the construction period and curing of the concrete became an acute problem. Membrane curing was used, and was applied with a hand spray bar. When applied too soon the spray marked the finish of the wet concrete and if applied too late the surface developed hair cracks from the heat. After some experimentation, the application of the curing compound was adjusted properly.

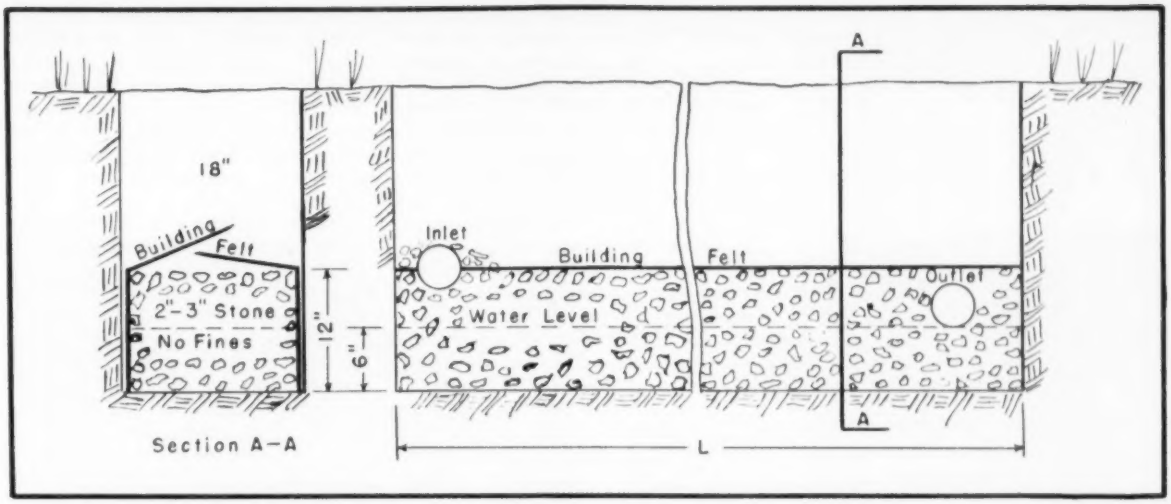
Upon completion of the placement of concrete, all of the joints were cleaned throughly with compressed air, using additional handwork where necessary. The joints were then filled with hot poured penetration asphalt.

On October 8, 1953, the extension was officially opened to air traffic, thus giving Blue Grass Field, in addition to its two 3500-foot runways, one 5000-foot runway capable of handling four-motor planes with ease, and allowing a greater safety margin for smaller planes when required by weather and load conditions.

Engineering and inspection for the project were under the general supervision of G. R. Watkins and C. W. Lovell, of J. Stephen Watkins, Consulting Engineers. The author was Resident Engineer for the Consulting Engineer. The construction contractor was Harry O. Wyse, of Lexington, Kentucky, with Walt Verser as Superintendent.

Blue Grass Field, a jointly-owned project of city and county, is supervised by a local board and operated by an Airport Manager, O. R. Parks. Mr. Parks and his maintenance crew ably assisted both the contractor and engineer in this runway extension.

● **POURING concrete from mixer on one of the new concrete 10-foot lanes.**



● TYPICAL trench design, showing section and inlet and outlet elevations.

RATIONAL DESIGN
for Ground Absorption

OWEN G. QUENELLE, Assistant Sanitary Engineer, Department of Public Health, State of Alabama

NEEDS for improvement in the methods of constructing ground absorption systems and for a rational method of designing for the disposal of septic tank effluents has been recognized and much discussed in recent years. The points most commonly considered essential are the absorption rate of the soil and the change in absorption rates due to the effects of septic tank effluents.

During the past five years the writer has, in a limited way, engaged in experimental research with septic tank effluents. This work has been strongly influenced by the results obtained with ground absorption fields and positive outlet fields of conventional design during the past 25 years in Alabama. The experiments are so far limited to systems of larger size, such as may be used at schools, tourist courts and factories that cannot be served by a public sewer.

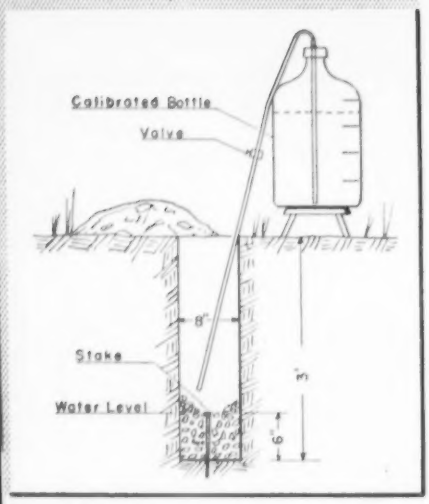
The work on improvement of ground absorption methods in Alabama appears to be pointing to a simple and inexpensive plan. The absorption trench has a standardized width of 18 ins., and the depth can also be standardized to between 30 and 36 ins.; but the length is variable and is controlled by the loading, the available space and other factors. The bottom of any one trench is level from end to end. Several trenches may form a system, with all bottoms at the same elevation. More than one system can be used in a field at different elevations.

In constructing the trenches, after excavation, heavy building felt or roofing paper is placed lengthwise along the trench walls and pegged with nails. Sized stone, 2 to 3 ins. in diameter, with no fines, is placed one foot deep and leveled so that the upper part of the building felt can be folded over the top of the stones. This protects the voids in the stone fill from enchroaching earth. No pipe is used in the absorption trenches. Connecting trenches within a system are built like absorption trenches. The inlet pipe is set near one end of the trench, or near a corner of a system of trenches, from 8 to 12 ins. above the bottom. The outlet pipe is set diagonally opposite the inlet and 6 ins. above the trench bottom. This raised outlet pipe forces all trenches at any one elevation to store liquid for absorption up to 6 ins. in depth before any water can pass to the next trench or to the next system of trenches or to a positive outlet. It forces 100 percent distribution in the trenches and, therefore, full utilization of the designed absorption area.

The trench width has been fixed to facilitate the taking of design data in the field through the use of a specially arranged absorption test. In the course of the work it has been found that the system can be installed either on level ground or along contours without exceeding a 3-ft. trench depth. Pipe is omitted from the absorption trenches for the reason that the cross-sectional area of the wetted voids in the stone is about 3.5 times as great as is the flow area of a 4-inch pipe, and the voids, even in installations using pipe, have more often than not been used for water passage. No form of dosing arrangements is needed.

Testing Absorption Rates

That many factors influence the rate of absorption is well known. Most of these factors are not easily allowed for in design. However, an arrangement of the elementary variable factors, as time, surface area and volume, in relation to other values that may be held constant offers a means of design which eliminates from consideration other, more difficult, but less important, factors.



● **HERE'S how to find "t", the asborption rate for designing.**

The absorption test used in determining the time factor bears a close relationship to the standard method. A round hole, 8 ins. in diameter is put down to the proposed depth, 30 to 36 ins. of the trench bottom. A small stake or peg is driven into the bottom at about the center of the hole, so that the top of the peg is six inches above the hole bottom. Small stones, 1 or 2-inch diameter, are placed in the hole to the height of the top of the peg; and some are piled higher next to the walls. Four one-gallon glass jugs with stoppers have been found satisfactory for adding water to the hole. However, a large container may be used if it is calibrated in gallons. At the beginning of a test, with a timer ready, the hole is filled to about 3 ins. above the top of the peg. When seepage has drawn the water level down to the top of the peg, measured water is started into the hole at a rate sufficient to maintain the water level at or very near the top of the peg. The time value (t) is the maximum number of minutes required for adding one gallon of water after the absorption rate has apparently leveled out. Experience has shown that from 3 to 10 gallons added practically continuously will give a reasonably well-defined rate of absorption.

This test has been used in several of the different soils found in Alabama and rates have varied from 5 minutes to 400 minutes per gallon. It now appears that the minimum absorption rate, or the greatest value of (t) that will be usable for total ground absorption must vary inversely with the population served. For example, if a soil has an absorption rate of 250 minutes, a small number of people can be served at a reasonable cost, but the cost for complete ground absorption for a large number of people may be prohibitive, although the cost per capita would be less than that for the smaller installation.

The effect of seasonal variations in ground water is, of course, very great. The absorption tests made in this area have been made when ground moisture was about average. Under this condition, due to wetting by the test, results are a measure of the rate of water movement through the soil when ground moisture is somewhat above average; and on this basis complete ground absorption can be designed with reasonable certainty up to this value. Observations have indicated that absorption fields based on this criterion operate at about 30 percent wetted during hot dry weather and near 100 percent wetted during cold wet weather.

The establishment of the value of (t) permits a general determination of the area and, consequently, the length of the absorption trench required. However, a modifying factor must be introduced to provide for storage of peak flows and also to obtain capacity in the trench system to allow for fluctuating flows, such as from schools and factories, which operate only a few hours a day. In this case, it is necessary to insure absorption at a rate, when the trench system is 6 ins. deep in water, equal to the average rate of flow during the period of use. Also, it is necessary to provide for variations in soil types and the effect these may have on the ability of the installation to absorb septic tank effluent rather than water. This modifying factor is termed K. Our experience has been that about six values of K will be required to meet all Alabama school conditions. The K for school usage is now fairly well established through experimental proving from estimated starting values and is about 1.87.

Computations are simplified by assuming that the standard test hole, 8 ins. in diameter and 6 ins. deep, is used. This has a surface area of 1.395 sq. ft. Then the gallons absorbed in sq. ft. per hour, G, will equal 43/t. Letting Q represent the daily water use per person; A the population; and H the number of hours during which flow occurs; and using the modifying factor K, the trench area required will be QA/H x t/43 x K. If Q is 15 gpcd, A is 100 and H is 8—common values for a small school—the area required in square feet is 4.355Kt. Since there are 2.5 sq. ft. of trench absorption area per lineal foot, the trench length L will be 1.742Kt. The overall expression for the length of trench L can be reduced to 0.009312KAt so far as schools are concerned, since Q and H values are quite stable and the K value given previously represents their relationships.

Several installations that were designed in this manner are now being used on an experimental basis. Some are nearing two years of satisfactory service. The school installations vary in size in population served from 600 to 900 and in the value of (t) from 5 minutes to 350 minutes. The cost of this type of trench installation is much less than for the present standard trench. Experience thus far indicates that it should serve as well or better. It is more adaptable to the soil and terrain conditions found at a large percentage of the sites that must be used for this purpose.

When planning for large size absorption fields, the use of an absorption test is a practical advantage from the economic and technical viewpoints. The effect of septic tank effluent upon the absorption rate does not yet appear to be a serious handicap. This is especially the case where the installation serves only one kind of establishment and the load upon the disposal area is intermittent.

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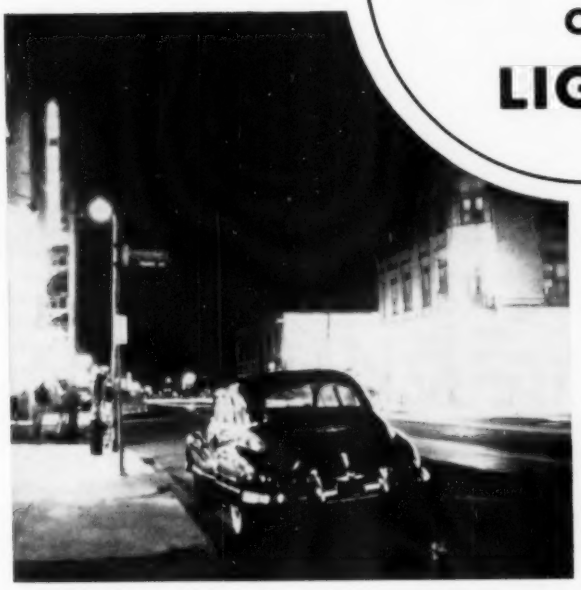
Preventive Street Cleaning Program Stops "Litterbugs"

Determined attempts were made last year by the City of San Francisco to stop "Litterbugs" from scattering papers and debris on the streets. The worst offenders were the two garbage collecting companies and the food stores. Improperly loaded garbage trucks and trash filled boxes in front of stores were mostly the source of wind swept papers being found throughout the City.

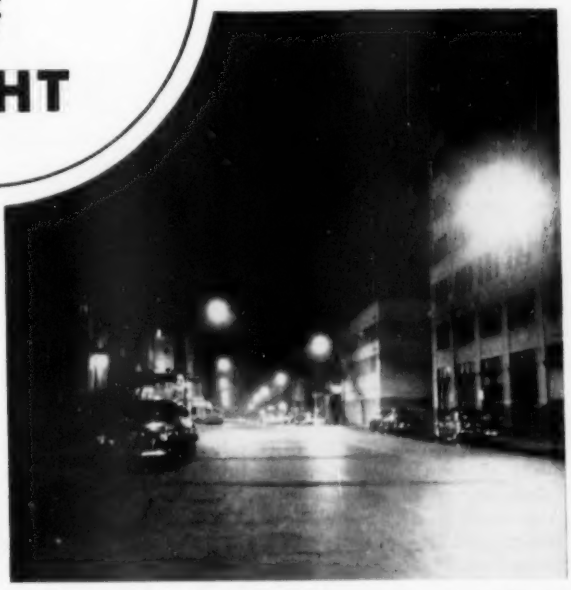
With the cooperation of the District Attorney, the Municipal Court and the Police Department, a drive was started in March, 1953, in an effort to eliminate the dumping of garbage in street cans, lots, parks, or on the streets. Several convicted violators were fined amounts ranging from $10 to $100 for each offense.

Suggestions were made to the School Department that time be devoted to an educational campaign in the elementary and high school grades to stress good housekeeping in the streets as well as the home.

HOUSTON
The NEW City of LIGHT



● BEFORE, most of light coming from other sources.



● AFTER installation of 15,000 lumen mercury-vapor lamps.

THOMAS MARTIN

WHEN the great French philosopher, Voltaire, said: "Give light and the people will find their own way", he was expounding one of the great truths of all time.

The city fathers of Houston, Texas, however, are not worldly philosophers. They decided to take Mr. Voltaire at his word—and literally give the people light. They're doing just that now—and plan to do more of the same in the years to come.

The result is that while Houston, one day, won't be laying any claims on Broadway's "Gay White Way" title, it will hold its own with any city of comparable size in the country—and, maybe, go most of them one better.

For Houston's lighting program has two distinct goals: 1. To provide street lighting for those areas that have never had it. 2. To replace outmoded lighting along the main thoroughfares and in the central business district with the most modern lighting fixtures now available. Standards are being furnished by Kerrigan.

These two steps are being implemented simultaneously, and while the program is far from being completed, the results are already attracting more than considerable notice.

While erection of new light standards in previously unlighted areas is certainly worthy of note, it's the newer type, modern lighting fixtures that have drawn attention to Houston's up-to-date program.

The backbone of this program of replacement is the General Electric mercury-vapor lighting unit. So far this year, Houston has installed 239 of these mercury type lights—and future plans call for the installation of 1772 in 1954. The 814 now in place have shown the city they are well worth the trouble, and the cost.

Why mercury-vapor—as against incandescent lighting? Houston's Director of Public Service—whose job it is to plan and implement such activity—J. B. White, gives these answers: 1. More light from less lights. 2. Less cost per unit of light. 3. Greater safety for motorists and pedestrians.

The incandescent lighting fixtures that have provided the major portion of the city's public lighting in the past give off a comparatively small amount of light. The 6,000 lumen light provides an average light intensity of one-tenth foot candle on the street. The mercury-vapor unit with modern luminaire, on the other hand, provides from 0.7 to 0.85 one foot candle—an increase, per unit of light, of at least 700 per cent.

So far so good. What about the cost? Is it in direct ratio to the increased power?

There's the beauty of the situation. On a proportionate basis, the cost, as compared to the increased light, is far lower. One incandescent light will cost $60 yearly in energy consumption in Houston. Figuring eight lights to the block—for this is how many are needed on the average Houston block to give the minimum light—the cost is $480 yearly per block.

Take the mercury-vapor light, on the other hand. The energy consumption per light per year will figure out to $126. But there are only four mercury-vapor lights required per block. They will cost $504 per year per block.

The increased cost is a mere $24—only five percent. The equation is startling, when figured on a per block basis: A 700 percent increase

● **MERCURY-vapor General Electric luminaires are mounted on 30-ft. high Kerrigan light standards. This is a day-time view in the downtown section of the city.**

in light—at a five percent increase in cost. No man need be a mathematical genius to recognize, immediately, the economy involved.

Initial replacement, of course, is another matter. It costs about $800, according to Mr. White, to install a unit of mercury-vapor light, after such things as tearing up streets, dismantling old lights, laying underground cable and erecting the new fixtures are taken into account. While the initial cost is high, there's no question that in the long run, the lights pay for themselves. With that thought in mind, Houston is pushing its program of providing major downtown areas, first, then other thoroughfares, with the newer type lighting.

In addition to the 1772 mercury-vapor type lights, the city plans to install 34 of the 10,000 lumen incandescent lights and about 1,500 residential street lights. These will be installed during the remainder of this year and next year.

Where residential street lighting is installed, property owners pay for energy consumption five years in advance. This figures out roughly to about $50 per home. After that, the city bears the energy consumption costs.

When the present program—drafted by the city and the light company in 1950—is completed, the city will have almost 16,000 street lights—about 5,000 more than compared with the city's total at the start of 1952. More important, Mr. White said, many of the lights will be of the mercury-vapor type.

As for the future, Mr. White said, that depends on continued cooperation between the city and the light company. If past performance is an indication, he said, there's no fear about the direction Houston's future lighting programs will take. Plans call for the installation of about 2,000 street lights per year—about the maximum that can be handled by the light company. Of course that means that Houston's complete lighting program won't be finished for many years—but the start has been made and the foundation laid.

One important factor, Mr. White believes, compensates for the trouble and cost of new and better lighting facilities. This is crime prevention. "Statistics have shown", he said, "that where lighting is adequate, crime decreases. That's one of the main reasons we want to light up every area possible in the city."

With Houston's program, the wish is on the way toward becoming a reality.

● **THIS is the type of standard the new program uses in residential areas.**

New Jersey Turnpike Shows Traffic Increase in 1953

Traffic on the New Jersey Turnpike in the first nine months of 1953 showed an increase of 23.9 percent compared with the same period in 1952, the Commissioners of the Authority stated in a report to bondholders covering the period. Toll and concession revenues were up 20.9 percent. In the nine months ended September 30, 1953, traffic reached a daily average of 60,500. Tolls and concession revenues amounted to $16,146,353 in this year's nine months compared to $13,354,642 in the similar period a year ago. Turnpike use by commercial vehicles continued to register sharp increases. The greatest gain in the nine months of 1953, 68.3 percent, was shown by buses. Truck usage was up 57.3 percent. Passenger cars represented 88.7 percent of all vehicles using the Turnpike in 1953 against 91.2 percent in the same nine months of 1952.

The safety record of the Turnpike showed further improvement compared to a year ago. During the September quarter of this year, 15 neon-lighted signs to inform motorists of slower speeds because of fog, snow, ice and other conditions, were completed and erected. In all there are 17 of these signs from South Brunswick to the George Washington Bridge interchange, a distance of approximately 32 miles.

During the first nine months of 1953, the records of the State Police showed an accident rate of 62.1 (411 accidents) per 100 million miles of vehicular travel. This was a reduction of 31.9 percent compared to the rate of 91.2 per 100 million miles in the corresponding period of 1952.

While figures are not available for the public highways in New Jersey for comparable interim periods, the rate on the latter for all of 1952 was about 380 per 100 million miles or more than six times that on the Turnpike. Moreover, the Turnpike's accident rate represents but a fraction of the experience on the nation's highway system as a whole. Careful analysis shows the causes as (1) inattention to driving; (2) losing control and overturning, or striking guard rail, bridge abutments or other fixed objects; (3) several of the "pedestrian" type where persons walking on the highway were hit by vehicles and, (4) falling from vehicles.

● BEFORE improvement. Note the old style light pole.

● AFTER—Showing widened roadway and new lighting.

REPAIRING and WIDENING a HEAVILY TRAVELED VIADUCT

JOHN E. HUBEL

WISCONSIN Avenue crosses the Menominee Valley by means of a reinforced concrete viaduct 1,457 feet in length. This street is one of the city's main outlets to the west and carries as high as 43,000 vehicles per day at times of heavy travel. The viaduct is located about four miles west of the main business district. As originally built in 1910, this viaduct was carried on ten reinforced concrete arches, one 60 feet, eight 145 feet and one 80 feet in span. The roadway was 46 feet wide, with a 6-foot sidewalk on each side. Rails and lighting posts were of concrete.

Some of the concrete sidewalks and handrails had deteriorated and there was also some evidence of disintegration on the faces of the arches. Investigation disclosed, however, that the arches were structurally sound. It was decided to replace the defective concrete and to widen the viaduct at the same time. The work was started in 1950, the work being let in several contracts spaced some time apart so that it would not be necessary to close the viaduct to traffic. The scheme worked successfully and the viaduct was open to traffic during the entire reconstruction period.

The new roadway is 58 feet wide with a 7-foot sidewalk on the north side and a safety walk two and a half feet in width on the south side. The walks are on concrete brackets, cantilevered out from the sides of arches and piers. The old concrete was repaired by cutting away all deteriorated concrete, drilling holes at approximately 2-foot centers, in both directions, installing expansion anchored hook bolts and placing new reinforced concrete in wood forms. The minimum thickness of the new concrete facing was six inches. New concrete curbs between the roadway and the sidewalks are 18 inches high to prevent vehicles from entering the sidewalk area.

The old concrete sidewalk railings have been replaced by new handrails of structural steel. Steel lighting posts are also used. The efficiency of the lighting system has been increased by replacing the lights which were on short poles with lights on brackets extending out over the roadway. The new lights are about 30 feet above the roadway. The asphaltic concrete paving on the old roadway was placed in 1935 and was in good enough condition so that only the widened area needed to be paved.

This widening and remodeling project was started in December 1950, and was completed by the end of 1953. When the work began, a section of retaining wall, 300 feet long, was rebuilt at the southeast corner of the viaduct.

For the work involved, four contracts were let by the city, as follows: (1) Retaining wall at southeast corner of viaduct, to George Young Construction Co., for $88,868.00; (2) Reconstruction of north side of viaduct, to Concrete Contractors, Inc., for $322,567.00; (3) East half of south side of viaduct, to Concrete Contractors, Inc., for $135,620.00; and (4) West half of south side of viaduct, to Druml Company for $182,000.00. The total of the contracts was $729,055.00. To this should be added engineering and inspection costs of $40,945.00 making the total cost $770,000.00.

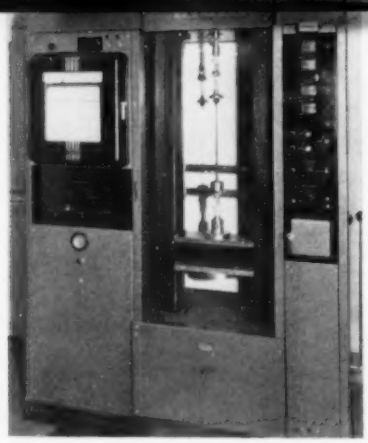
The viaduct was originally built in 1910 at a cost of $614,475.96.

The design and engineering supervision of the new work was done by the Bureau of Bridges and Public Buildings, of which George Ashton is the head, under the direction of Walter M. Swietlik, Commissioner of Public Works for the city of Milwaukee.

HOW To Improve ASPHALT QUALITY

WALTER F. WINTERS,

General Manager, Rubarite, Inc., Chicago, Ill.



● **TENSILE testing machine for measuring strength or toughness of asphalt.**

OFTEN a reappraisal and study of a given construction material yield startling and beneficial results. This has been true with steel, cement, stone and gravel used in highway construction. The study of soil mechanics in recent years has been of considerable benefit to the highway system. Asphalt, too, has been studied. All of these investigations and the resulting application of new knowledge have gone a long way toward meeting the challenge of heavy loads and high traffic volume so common on the highways of today. This article will describe recent investigations aimed at improving asphalt quality. Primarily, an asphaltic surface must serve two functions: (1) It must provide a tight, impermeable surface which will keep the supporting base courses dry so that they can maintain their best load carrying condition; and (2) it must present a smooth, non-skid, adequate wearing surface which will remain in that condition after years of hard usage.

The question immediately arises: What factors in the asphalts give us a binding material that tends to produce these results?

Inasmuch as asphalt is a binder for holding the particles of aggregate together, it must first have properties of adhesion and must be sufficiently strong or tough to withstand the traffic stresses placed on it. An asphalt must retain its toughness and adhesion at high temperatures in order to provide a stable and firm pavement. It must also be flexible and malleable, retaining its adhesion and strength at critical low temperatures to provide a surface that will not abrade and crack under heavy loads.

It has been evident to engineers for some time that not all the foregoing factors are present in asphalt as it is produced by nature in petroleum crudes. Nor is it possible or practical to compound asphalts or to combine constituent parts in such a manner as to produce all these desirable qualities. In other words, any major improvement in an asphalt at this time must be brought about by changing the basic composition of the material. This can be done in several ways, one of which is by the use of admixtures.

Synthetic rubbers are usually produced from petroleum. These elastomers contain many of the quality elements lacking in refined asphalts. Some of them have a natural compatibility with asphalt. It appears logical that a close combination of synthetic rubber and asphalt would have improved characteristics if the proper type of rubber is used. A close union is believed necessary if the characteristics of the rubber molecules are to be transmitted to the asphalt. To obtain complete dispersion of the rubber: (1) The rubber particle must be in its original state, that is not vulcanized, in order that heat and agitation can break it down readily. (2) Particle size of the rubber, to be mixed with the asphalt, must be infinitely small (the co-precipitated rubbers can be made to have particle sizes of 1 micron and less), thus presenting a relatively great surface area.

The production of rubberized asphalts has developed a new concept in asphalt technology. This technology is no longer an asphalt study alone, but is an investigation of a new material, and the expert must be a rubber-asphalt technician. His knowledge must extend beyond that of asphalts as he must also be familiar with the production and characteristics of elastomers. He must know their effects on the various asphalts because almost every type of rubber has a different effect. He must devise new methods of combining these materials with asphalts and develop new tests which will measure quality factors.

Rubber-Barytes

The Goodyear Tire & Rubber Company has been carrying on rubber asphalt investigations for 25 years and have channeled their research in the last 4 or 5 years to rubber—barytes compounds for use in rubberizing asphalts. The investigations are not complete but some very interesting data have been developed.

In manufacturing the rubber—barytes compound, approximately 23 percent of GRS Type II rubber is combined with barytes solids by mixing latex and a slurry of the barytes. The rubber clings to the barytes particles. The combination is dried and reduced so that all material passes a 100-mesh sieve. The compound, called Rubarite, is packed in fifty-pound bags and is free flowing. Its specific gravity is approximately the same as asphalt, thus facilitating mixing.

A number of studies on adhesion tests are being made, none of which is ready for complete report. Among these is the standard low temperature "bond-break" test wherein an asphalt joint is poured between two concrete blocks and the joint broken at low temperature. It has been found in these tests that the barytes-rubber asphalt has an exceptionally strong bond to the concrete; in fact, in virtually all cases the bond between these surfaces did not break—the failure occurring in other places. On the other hand, the untreated asphalts nearly always tend to break at the interface.

Another adhesion or tackiness test

aims at determining the laying time available to place cover stone on freshly "shot" cutback on seal coat projects. In this test the surface of a prepared specimen is repeatedly contacted by a spherical surface as the temperature of the cutback is either slowly raised or lowered. The temperature at which significant adhesion is obtained establishes the lowest temperature at which seal rock could be expected to "stick" in the freshly laid cutback. Although this test is incomplete, it is noted that a much wider range of satisfactory "laying" temperatures are available using a barytes-rubber asphaltic cutback.

An interesting new test is a method of measuring the toughness of rubberized asphalt. While the development of this test is being continued, it is felt the data thus far developed are interesting enough to afford a detailed description. In this test the asphalt to be tested is poured into the cup shown in Figure 1. The ball is inserted in the hot asphalt and the entire device allowed to cool to the testing temperature. The tests are conducted in a controlled temperature room. An ultra-sensitive tensile testing machine is used with the upper and lower rods of the testing device clamped in the upper and lower jaws of the machine. When tests are started the jaws pull apart and the load required to pull the ball from the asphalt is measured. The testing speed of the machine can be varied from 20 inches per minute to .02 inch per minute. Thus flow properties can be studied over a wide range of speeds. Figure 2 illustrates typical curves obtained in these tests. Consider the curves for the one-inch-per-minute test speed. It is apparent that the barytes-rubber asphalt has increased elastic and viscous force components with which the asphalt resists deformation. Hence the tests predict that in service greater impact strength will be obtained as well as improved dimensional stability toward forces applied over a period of time.

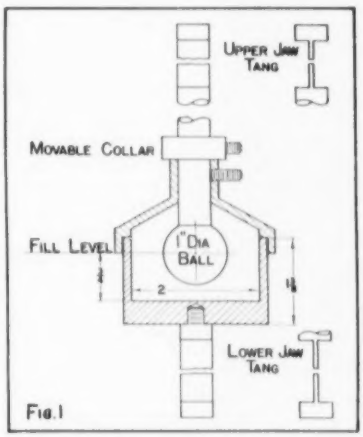
Standard tests may be used to indicate high temperature stability. For example the standard ring and ball test is a measure, to some extent, of the high temperature stability of the material. It has been determined that the increase in softening point of a rubberized asphalt is in direct proportion to the amount of rubber in the asphalt. In addition, asphalts from different sources indicate there is a different effect on their softening points with equal amounts of rubber. Generally, 3 percent synthetic rubber from a rubber-barytes source increased softening points from 10 to 18 degrees.

Interesting data have been obtained on the low temperature characteristics of rubberized asphalts. The standard low temperature ductility test has proved to be an excellent measure of flexibility at low temperature. It seems evident that if an asphalt has ductility and shows "stretch" at low temperature, it will have the ability to yield and recover under impact and traffic stresses, reducing the danger of failure under these conditions. Cracking due to cold-brittleness during the winter reduces the waterproofing abilities of asphalt pavements and seepage of water through such cracks accounts for many base failures. The improved low-temperature characteristics of rubberized asphalts tend to minimize this source of failure.

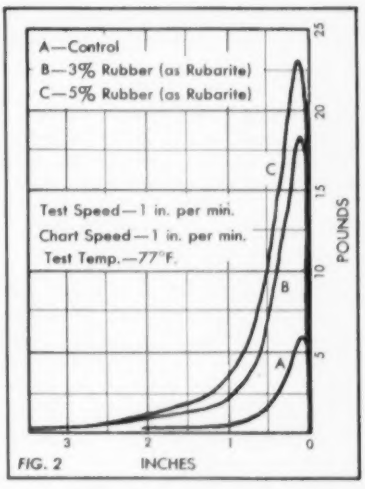
Startling low-temperature ductilities have been found with very low rubber contents when a barytes-rubber compound was used for rubberizing the asphalt. Using the standard (A.S.T.M., D 113-44) test at 39.2° F. it was found that with paving grade admixture asphalts a 150+ ductility was very common whereas the original asphalts had but 10 and 12 cm. ductilities. The impressive part of these tests was the fact that these results were frequently obtained when as little as 1.6 percent of rubber from a rubber-barytes source was used. In order to make the low temperature test more rigid, a 32° F. ductility test has been used also and the specimen is pulled at the rate of 5 *cms.* per minute. rather than the 1 cm. rate specified in A.S.T.M. procedure. The fast rate of pull at low temperature makes the test especially severe. Literally hundreds of the 32° special ductility tests have been conducted with many different kinds of asphalt. Very few untreated asphalts will show *any* ductility using this procedure and those that show a reading seldom have more than 5 or 6 cms. On the other hand, these same asphalts containing 3 percent rubber from a rubber-barytes source in a large majority of the cases had 150+ ductilities.

A review of the foregoing data reveals there is additional study necessary to perfect and amplify tests for measuring the quality of asphalts. However, it is also indicated quite conclusively that many factors affecting the quality of asphalt can be determined from tests presently usable and, even more important, that quality asphalts are now available. Seal coat projects in Arkansas have shown improved adhesion and toughness of barytes-rubber cutback asphalts while the high and low temperature investigations are concrete evidence of improved temperature susceptibility.

Hot mix projects constructed with this type of rubberized asphalt have had higher densities because rolling can be started sooner and be continued for a longer period of time. Feather-edging on overlay projects is much improved. When it is necessary to hand rake mixes it is noted there is much less segregation, and street intersections which often have to be laid in this manner have the appearance of a machine laid job. Longitudinal and transverse joints are much tighter.



● **DIAGRAM of apparatus used for the rheological study of asphalts.**



● **CURVES showing relation of force and elongation of asphaltic materials.**

ORGANIZATION for WATER

GUY BROWNING ARTHUR

IN Sacramento the water and sewer systems are owned by the city. They are joined for administration, with a gain in efficiency and a saving in operating costs. This is especially true of the Department of Distribution, which installs and maintains service on the streets. Distribution is one of four departments under E. A. Fairbairn, City Engineer, and Carl Jennings, Assistant. Its entire outlay in 1952 was only $106,616.

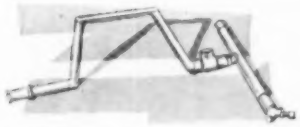
The organization for work is under Norman H. Squires, with the title General Foreman, which doesn't tell the importance of his job. He has a foreman for water and another for sewers, but the flexibility of the combined operation requires that each of these men is able to take over the other's work, or stand in for Norman Squires when necessary. The operation is remarkably impersonal, with every detail of supervision and street work thoroughly understood by those primarily concerned.

Flexibility is the quality they like to stress in talking about the Distribution Department. For example, in storm periods none of the crews is able to carry on its routine work, and might be laid off if held strictly to its job. But in such periods the emergency load of keeping gutter drains open to prevent flooding of the streets becomes critical. All crews are kept busy, doubling up in any way that may be best to keep drains and intakes open.

Mains are laid with crews of 6 men, using cast iron, asbestos-cement or steel pipe. Service crews consist of 2 men, a service man and helper, for both sewers and water.

Much Equipment Used

Distribution owns 900 pieces of equipment. In the list are big trucks of various kinds, including fully furnished tool trucks. The Department formerly made the tool trucks to fit its special needs, but now they are being purchased. They are similar to telephone repair trucks with every bit of space utilized to carry some tool or gadget. All the larger trucks are for installations, and can lay a main of any size or length, using any kind of pipe.



● **AUGER for boring to install service pipe without trenching cuts labor costs.**

The two repair trucks, each manned with a service man and helper, are trouble shooters, with about the same equipment as the tap trucks. Each tap truck, for installing dwelling taps, has a compressor and a boring auger, plus a full kit of tools such as wrenches, cutters, dies and special gadgets. It has also a Presto tank for soldering large copper pipe.

Three different tapping heads are provided, for the three kinds of main, for taps from ¾ to 2-in. pipe. A Mueller B machine cuts and taps in one operation. This cutting is against 40 lbs. pressure in the mains, a reduction from 60 lbs. at the plant.

A very satisfactory 2-ton crane was made in the shop from a trailer power unit and some odd structural members, all picked up from Army surplus. This crane gets a lot of work in placing pipe, handling buckets or even operating a drag line. Other equipment includes 9 compressors with 90-lb. hammers, 60-lb. asphalt cutters, and 35-lb. clay diggers. Tampers are carried for all kinds of soil and broken rock.

A Hough loader does the backfilling and loading, and is one of the most valuable units in the list. There are also 3 standard bucket-type sewer cleaner units made by Flexible Sewer Rod Company of Los Angeles, and a standard root-cutting unit with a gasoline motor installed in the back of the two-wheeled trailer unit.

Some ingenious special tools have been devised and built in the shop. One is a valve closer. The frame is welded pipe, raising the mechanism deck about 10 ins. off the ground. An air motor is direct-connected to a reduction gear which was robbed from a road grader. Damage to the gate valve or the closer is prevented by a shear pin connection

● **HAND-operated double ratchet key is utilized for opening large gates.**

and SEWER MAINTENANCE

between the reduction gear and the gear which drives the key-rod. Pipe bushings are welded into each corner to take drift stakes which are driven into the ground to hold the closer in position over a gate. A point is made of the quality of steel used in the 1-inch key-rod. They have found that this must be of tough steel to take the twist safely, and yet hard enough to wear for a long time without deforming.

This rig closes a valve very gently. If there is a sudden shock the shear pin fails, and is quickly replaced with another ⅜-inch bolt. In one closure which was carefully timed, a 36-inch gate with 264 turns was closed in 4 minutes. In operation the rig is set over a gate, the drift stakes are driven down, air is connected from a truck compressor and turned on at the rig, and the turning begins.

Another home-made tool is the auger for boring from a dwelling trench out under the curb and pavement to the main. It is made of 1-inch welded pipe in the shape of a carpenter's brace, with a bronze swivel and a hose connection. For boring, a length of ¾-inch pipe is screwed into the brace and an earth auger is screwed on the end. When a 3-ft. square hole has been cut in the pavement, down to the main, and the main opened with the tapping tool, water is turned on, and one or two men begin to turn the brace, moving forward in the service trench as the cutting proceeds. To bore through to the center of a residence street is routine, and to reach the center of a wide thoroughfare they only unscrew the pipe at the brace and add another length. If steel pipe is being used it is allowed to stay in place, but if copper pipe is required the steel pipe is withdrawn and the copper pipe, with a plug on the end, is pushed through the hole.

No trenches are cut in the pavement unless rock is encountered, and while the character of the soil varies greatly over the city it is not often necessary to resort to more expensive means than the auger. It is so fast that two taps are averaged per day through the year. Good relations with the street department insure that every cut made for tapping mains is paved next morning.

A simple and effective tool is a hand operated gate key. It has two ratchets at the top, and can be set for opening or closing. Usually one man can hold it and work one or both of the ratchets. But for quick or hard work one man holds the key upright while one or two men pull the ratchets.

Management Procedures

There is a remarkable degree of alertness and job consciousness in this department. It develops ideas for procedures as well as for new tools. Norman Squires went directly to a job one morning and had to wait 40 minutes for the crew. He found that the delay was caused by having to wait to get the truck and compressor serviced at the Corporation Yard. Further inquiry revealed that about half of the eighteen pieces of equipment that leave the yard every morning were held up in the same way.

He immediately reorganized the whole procedure. He took one helper off the field crews and made him a serviceman for all equipment. To avoid paying overtime this man was given a new classification, and is required to work about two hours after quitting time each day to fill gasoline tanks and change oil. He is compensated by having Friday off, and he can choose his own time over Saturday and Sunday to get all equipment ready for work on Monday morning.

The system for priority in installing taps was worked out in somewhat the same way. Previously the taps were installed according to the pressure which was exerted by one plumber or another, with unfairness to others who relied upon an orderly procedure. Now, as the orders for taps come from the water department up-town, they are put on the bottom of the pile. Each morning the orders are taken off the top, as they come, and assigned to the crews.

From time to time the water department has complaints that certain taps have been delayed, and occasionally a plumber insists that he is not being reached promptly. But the system is so simple, honest and effective that it demonstrates its value every time it is questioned. Since Norman Squires, or whoever is on the desk in his place, knows about how many taps are being installed per day, he can tell a plumber just about what day he can

(Continued on page 113)

● **AT SITE of main break, record book is opened to find gate location, etc.**

For a VENTURI LIFE BEGINS at 40

HOW old is "old" is a question that requires careful thought and consideration. If a piece of equipment is as good as new, and can give several additional years of service, it cannot, in the literal sense, be called old and useless. The following case illustrates the point.

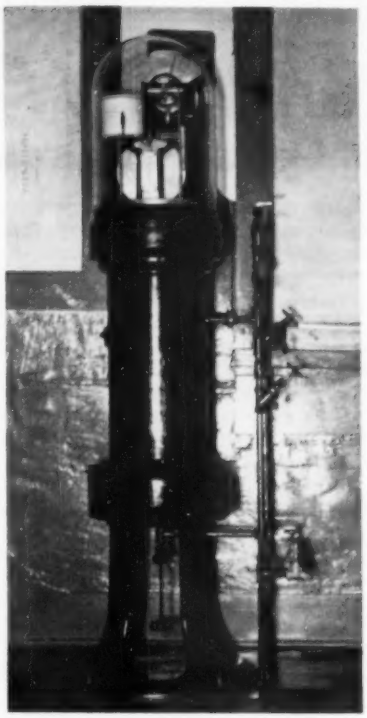
In service for a period of over forty years and still in excellent working condition, pulled out of service because of an extensive expansion program, stored for possible future use, purchased by another municipality, reconditioned for new requirements at minimum labor and investment, and finally placed back into service at a fraction of the cost for new equipment is the history of the fine record of achievement accomplished by a Simplex venturi meter. It is another proof that careful manufacture and proper use of equipment pays off in the long run.

Chronologically, the case history of this "life begins at 40" meter had its beginning back on May 12, 1912, when the City of Wooster, Ohio, acquired this eight-inch Venturi tube and meter. It was installed and performed satisfactorily for many years with a minimum of attention until Wooster had to embark on a program of expanding its water facilities in order to meet demands of increased industrial production and expansion. It was then decided that the Simplex Venturi could not take care adequately of the increased water measurement requirements. As a consequence, the meter was taken out of service and placed to rest, and well earned at that, in one of Wooster's municipal storage yards.

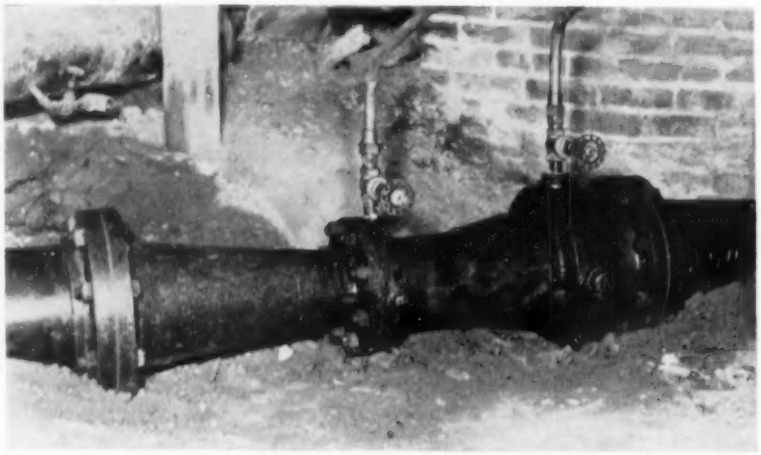
Meanwhile, a nearby municipality, the Village of Millersburg, Ohio, was faced with a problem of metering its water supply. C. R. Deitrich, Superintendent of Water Works, Millersburg, Ohio, having heard of the "retired" instrument at Wooster, recommended to his Village Trustees on the Board of Public Affairs that this particular instrument be purchased. It was therefore acquired on the recommendation and placed in operation after necessary repairs and alterations.

The total cost of the meter installation was only $124.45. Included in this amount are labor, Venturi tube fittings, gate valves, copper tubing, and $30.25 for Simplex replacement parts.

Broken down, here are the costs for installing the meter:



● AFTER 40 years of service, reconditioned and working again like new.



● ON-THE-JOB view of the 40-year young venturi meter at Millersburg, Ohio.

Labor	$25.00
Welder	12.00
Material:	
Clow fittings	41.13
Copper tubing	6.40
2-¾-inch gate valves	9.67
Simplex parts	30.25
Subtotal	$124.45
Manometer test	85.00
Total	$209.45

In commentating about the job, Mr. Deitrich states, "I believe that this new "old" set-up will give us years of satisfactory service with very little maintenance. Furthermore, the Village of Millersburg saved approximately $1000.00 over the cost of a new unit which is an important saving to the taxpayers of this community of 2,500 population." Continuing, he said, "The days of estimating the amount of water pumped are over, as we can now give an accurate report of the amount pumped, plus the cost per 1,000 gallons. No water works is too small not to have a Venturi meter as part of its regular equipment."

● MAN on the job can be reached quickly by means of the two-way radio system. He can also report on conditions.

● WORK orders and instructions are transmitted promptly from headquarters to employees in the field.

TWO-WAY RADIO SAVES TIME and MONEY FOR MAINTENANCE OFFICIALS

PHIL HIRSCH

Two-way radio systems are performing a variety of vital tasks for highway departments, municipal street and sewer departments, bridge departments, and water departments throughout the country. Officials in several of these departments have reported that transmitters and receivers soon pay for themselves because they permit men and materials to be shifted from one job to another in less time and at lower cost than are possible with older methods of communication. For example, the highway crew which gets its assignments by radio can accomplish much more work per day than it can if the foreman must drive to a telephone whenever a job is finished.

"Thanks to our two-way radio system, every member of the highway department staff is in touch with each project going on in the field," according to William J. Karas, superintendent and engineer, Delta County, Michigan road commission. Formerly, superintendent Karas used the telephone to contact his district foremen. But this system worked only early in the morning, before the foreman left the district garage, or late in the afternoon, when the foreman returned.

If something came up during the working day that required immediate attention, the superintendent had to drive to the job site, a trip which usually required several hours. "We have found that the greatest value of our radio system lies in the day-to-day handling of administrative details," Superintendent Karas added. "For instance, when time cards are being filed, there is now no delay as a consequence of an error being made in the field. The office employee merely picks up the microphone and asks the foreman for the correction."

In Chelan County, Washington, district foremen sit in on a kind of "roundtable radio discussion" every morning. The day's plans are reviewed, and changed where necessary; road and weather conditions are discussed, and local complaints are aired.

● RADIO communication equipment has saved money on many jobs. This is a Wyoming State tower.

The Delta County road commission has learned that radio drastically reduces equipment downtime. Every winter, some snow plows go off the road. The transmitter-receiver in the ditched plow connects it to the garage, so that help is quickly dispatched. It takes about 19 minutes to get the plow back on the job. Before the radio system was installed in 1948, a minimum of an hour and a half was required for this task. Radio has produced additional savings in the operation of Delta County snowplows. Before radio communications were installed, two men—a driver and a helper—were assigned to each vehicle. Now, only the driver is needed. If he runs into trouble, he can get help via radio within a few minutes.

"We saved $5,000 on our snowplowing operation last year because the plows were radio-equipped," says Louis E. Tucker, secretary of the Emmet County, Michigan road commission. He added that recently, a loader that had been cleaning and shaping ditches broke down. The damaged loader halted operations of a foreman, 10 men, a motor grader, three trucks, and five equipment operators. This crew was costing the county $250 a day.

An engineer and mechanic, summoned by radio, were at the scene of the breakdown a few minutes after it happened. When it was learned that the loader had to be

towed in to be fixed, the engineer, by contacting other crews in the vicinity, found one which could use the idle men and equipment. As a result, the loss of time and money caused by the breakdown of the loader was kept to a minimum.

"When one of our foremen overestimates the amount of concrete needed for a job, he can radio headquarters to ask where an extra batch of concrete can be used," reported Irving R. Worthington, supervisor of roads, Burlington County, N. J. "If he underestimates the amount needed, he can radio for more. Either way, there is a definite saving in time and money. The foreman uses the radio instead of driving in to report his incorrect estimate. And if the job is being held up for lack of concrete, an extra batch can be shipped out in time to avoid excessive overtime."

Radio not only saves time and money, but improves public relations as well. Calls from irate motorists regarding damaged pavement are a familiar story to highway officials. Without a radio system which can dispatch repair crews to the scene, it's usually necessary to tell the taxpayer, "We'll take care of it as soon as possible." At best, this is a less-than-satisfactory answer. But thanks to radio, many departments are often able to get their repair crews to the scene of the trouble almost before the motorist has left. In Los Angeles County, California, according to Chief Deputy Road Commissioner Earle A. Burt, the repair crew is usually in the vicinity of the trouble 15 or 20 minutes after the complaint comes in.

Aside from day-to-day operations, radio is playing an important role in a host of emergency situations. When a worker in a highway crew gets sick or injured on the job, help summoned by radio comes on the double. In many parts of the country, reports on highways blocked by snowfall, snowslides, bridge washouts, or fallen timber are sent by repair crews at the scene to headquarters. This information is then relayed to motorists.

Perhaps the most dramatic emergency use of radio occurred during the floods in Kansas City. Spotters, equipped with walkie-talkie sets, stood on bridges in the inundated area, watching for capsized boats and people clinging to wreckage. Frequently, freight cars drifted into gasoline tanks and caught fire, or high-tension wires shortcircuited. Radio was used to get the fire department to the scene. Walkie-talkies reported weak spots in dikes and danger to viaducts so that workers could be dispatched to vulnerable points. During the most critical phases of the flood, the walkie-talkies, located on high ground, kept local, state, and national officials in charge of rescue operations in touch with the situation.

The two-way radio system in Burlington County, New Jersey, manufactured by Motorola, consists of a 60-watt base station and 12 mobile units. It serves 510 miles of roads. A control unit, with handset, enables the dispatcher to communicate with the entire highway maintenance fleet. A four-leg, steel transmission tower, 205 feet high, holds a 15-foot directional antenna that propagates a figure-eight pattern over the county, which is 45 miles long. Mobile units are installed in the county engineer's car, the supervisor's car, and the foremen's pickup trucks. The original cost of this system was about $13,000. Operating and maintenance costs amount to about $600 a year.

Here are some other cost figures for typical installations. Suppliers include Bendix, Hallicrafters, and Motorola.

The system maintained by the Washington department of highways ties in 62 cars, 56 trucks, and 21 snowplows. Installation cost was $250,000.

A county network, consisting of a base station and 16 mobile units, covers 1,461 square miles and 912 highway miles. Installation cost was $15,600. A similar system, with seven mobile units and one base station, a coverage of 1,300 square miles and 927 highway miles, cost $9,400 to install.

Iosco County, Michigan, has four of its highway maintenance vehicles equipped with two-way mobile equipment. Total cost of maintaining the system is about $785 a year.

Pierce County, Wisconsin has three vehicles equipped with two-way radio. Installation cost was about $3,500. Maintenance cost is about $40 a month, according to Roy Swanson, Pierce County highway commissioner.

In recent years, many state, county, and municipal officials have been faced with the problem of converting their AM radio systems to FM networks. When LaCrosse County, Wisconsin, made the change a few years ago, rebuilt FM units were purchased. The savings on these units, compared to their price new, was between $3,000 and $4,000, according to County Highway Commissioner Paul A. Hartwig. Last year, the units were sold for the amount they had cost as factory-rebuilts, and the money helped buy new mobile units of improved design.

In 1952, the Wyoming highway department installed a new two-way FM radio system at a cost of about $288,000 which blankets the entire state. The area involved is half again the size of the six New England states, although the population is one-third that of Rhode Island. Wyoming's 5,500 miles of state highways carry a heavy and varied traffic load which includes vehicles from ranches, farms, oil wells, and mines. Wyoming residents think nothing of driving 200 miles to see a basketball game, and thousands of vacationists flock to the state every summer.

Wyoming officials had several problems to contend with when they decided to replace the AM equipment which had been installed in 1940. First, the new net had to operate over some of the roughest terrain in the nation. It was thought originally that line-of-sight transmission would be necessary for efficient operation of the new FM system. Because of the rugged mountains, there were only a few spots—on the highest peaks—where line-of-sight towers could be built. But operating from these locations meant installing miles of powerlines, building access roads, and using engine-driven generators. If such generators broke down or ran out of fuel in bad weather, there might be serious interruptions of service at a time when it was needed most.

Officials knew that equipment which is serviceable at sea level is not always satisfactory at altitudes of 5,000 to 10,000 feet. Another problem was the fact that the new system had to serve both police and maintenance vehicles, since both functions are handled in Wyoming by the state highway department. The department wanted a system which would permit vehicles performing either job to communicate with each other. Yet, they knew that one frequency wouldn't be able to handle both police and maintenance vehicle messages. Because of these two factors—the need for serviceability at high altitudes, and the need for a flexible two-channel system, modifications of standard two-way radio equipment was necessary.

To solve the first problem, the

(*Continued on page* 124)

LOW-COST STREET PAVING PROGRAM

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Resident Engineer
State Hwy. Dept. of Georgia

A STREET improvement program was completed by Jesup, Ga., last summer. The work, involving approximately 6 miles of streets, included clearing and grubbing, paving, grading, roadway excavation, placing select materials, concrete pipe drains, drain pipe removal and relaying, removal of headwalls and incidentals.

The paving program was launched in 1952 by the Jesup and Wayne County Chamber of Commerce, the Mayor and Council and the local newspaper cooperating. After a mass meeting of citizens with the Mayor and Council, the administration requested the City Attorney and the writer to investigate the legal and construction phases of street improvement, looking to a "low cost type", and submit recommendations.

Under city charter provisions the City was authorized to improve streets and lanes by petition of abutting property owners. The law required 51 percent of property owners to petition for paving but the administration resolved to make the minimum 70 percent to reduce the objections and no street was paved where less than 70 percent petitioned. Actual construction was started when approximately one mile of paving was petitioned for. Action was somewhat slow at the beginning but as the work progressed and the citizens learned more about the type of work and cost they signed up very readily.

The paving plans called for a bituminous road mix base with single surface treatment—Type 1, according to Georgia State Highway Specifications. A Barber-Greene and a Wood mixer were used to mix material for the 5-in. base course, using 0.60 to 0.70 gallon of RC-3 per sq. yd. After the mix was properly spread and aerated it was compacted with 5-ton tandem and traffic rollers. The surface treatment consisted of 0.27 to 0.30 gallon per sq. yd. of AC-15 with approximately 40 lbs. per sq. yd. of No. 5 slag, rolled with 5-ton tandem.

The soil in most streets of the City was ideal for the type of construction used, except where clay had been previously added to stabilize the roadway. Tests were made and all soils were removed if more than 20 percent clay was indicated. Grades were brought up from borrow hauled in by trucks. The grading was accomplished with tractor-drawn pans and motor patrols plus a small amount of hand work for dressing swales. Drainage was not much of a problem since the City had already cut most of the ditches and swales required. Grubbing entailed considerable work due to streets being lined with large trees whose roots had penetrated the subgrade and had to be cut away and removed.

Cost and Financing

Construction of the project was done under a cost-plus agreement with the contractor. The cost of improvements included all materials, machinery and equipment rentals, labor, actual wages and salaries of all men actually at work on the project, plus social security, unemployment insurance, taxes, public liability, property damages, fire, theft, and other incidental expenses required for proper construction. The contractor submitted insurance coverage for Workmen's Compensation with legal requirements, Public Liability, $25,000 and $50,000 and Property Damage $10,000 and $20,000. All items of costs were included in the payments. The City furnished the borrow material. Herewith is the break-down of unit cost included in the agreement:

Clearing and grubbing,	$ 0.11 Lin.Ft.
Paving, complete	1.28 Sq.Yd.
Machine grading	30.00 100-ft.
Roadway excavation	.73 Cu.Yd.
Base Course Matrls.	1.25 Cu.Yd.
15" Conc. pipe, Class A	3.50 Lin.Ft.
Pipe removed	.50 Lin.Ft.
Pipe removed & relaid	2.60 Lin.Ft.
Headwalls removed	10.00 each

These unit costs were agreed upon by the contractor and the city and were based upon costs for similar

● **WOOD mixer was used to mix soil and bituminous material in the preparation of the base course.**

● **SPREADING covering aggregate over the bituminous seal coat to form the wearing course over the base.**

work in the vicinity of Jesup. The contractor submitted the amounts of the various units from time to time and was paid the agreed unit cost plus 20 percent.

The total cost to property holders was set at $1.75 per lineal foot front of property abutting on the pavement. An agreement was made that if the cost was more than $1.75 per lineal foot, the contractor would absorb it and if it was less, the contractor and the city would divide the excess equally. There was a small profit at the end of the program.

Financing was agreed upon as follows: The contractor was to be paid one-third cash upon completion of the work, balance in one and two years with 6 percent annual interest.

The contractural elements of the paving program was the leading incentive to go ahead with the work. In addition to the low cost of construction, as compared to former paving here (which in many cases exceeded $6.00 per front foot) the financing plan was very appealing. To eliminate the issuance of paving bonds or certificates, the City decided to use the contractor's equipment and facilities on the unit cost basis. This was accomplished under a force account plan that worked very well. Too, the contractor agreed to accept negotiable promissory notes payable in one and two years with 6 percent interest. The City is responsible for the payment of the balances and must collect from the property owners their prorata assessments over the two year period. Under the program the City is to pay for improvements of all street and lane intersections, which amounts to approximately 20 percent of the total cost. The total program cost $103,882.97, of which the property owners are to pay $83,106. and the City $20,776. (total cost items approximate).

• • •

To Measure Flow in Seepage Wells at Dams and Levees

A meter has been developed by the Corps of Engineers Waterways Experiment Station at Vicksburg, Miss., which will measure the seepage flow into pressure relief wells installed at the toe of earth dams and behind levees. Measurement of the flow from various strata, as well as total flow are obtainable. The meters are calibrated in relief well pipes. Meters used by field parties of the Experiment Station, calibrated in 6-inch and 8-inch pipes, show linear operation accurate to better than 3 percent over a range of flow from 10 to 1000 gpm.

MUNICIPAL POWER PLANT SAVES $11,700 in YEAR

IN many parts of the country, there has been pressure by suppliers of natural gas for higher prices and power plant managers are calculating the possible effects of this trend on the economic utility of the dual-fuel engine. The town of Lebanon, Ohio, is demonstrating that, even with the largest foreseeable price rise, the average plant will still find dual-fuels a sound investment.

Although paying the unusually high price of 55 cents per 1,000 cu. ft. for natural gas, Lebanon is earning substantial dividends from the operation of two new Worthington dual fuel engines. In 1952, with these units in service, average plant fuel cost per kilowatt-hour was 15 percent lower than in 1950, the last full year of straight diesel and steam operation. With production volume greater than 9,000,000 kw. hrs. this meant a saving of $11,700 in fuel costs through use of the gas-burning engines.

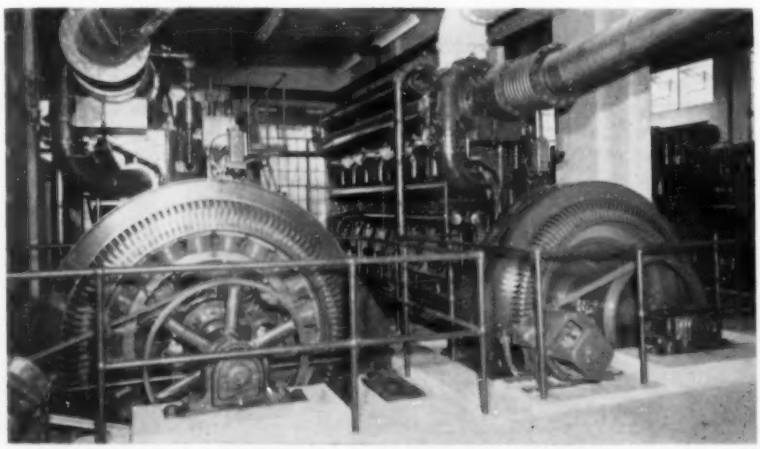
When load expansion made it essential to install additional prime movers, Lebanon determined that dual-fuel engines would be the most economical power producers. The engines chosen were two 8-cylinder, supercharged Worthingtons of 16-in. bore and 20-in. stroke, rated at 1,760 hp each at 360 rpm. Each drives a 1245-kw. generator.

Put into service in April, 1951, the dual-fuel engines vindicated the judgment of the city's engineers. In 1950, the last year of diesel-steam operation, fuel cost averaged 8.32 mills per kw. hr. In 1952, the first full year of diesel-dual-fuel operation, fuel cost averaged 7.04 mills per kw. hr., a saving of 1.28 mills per kwh or more than $11,700 for the year.

The fuel cost for the dual-fuel units alone, of course, is lower than the plant average cited. Currently, the engines are averaging consumption of 11 cu. ft. of gas and 0.0047 gal. of pilot oil per kw. hr. in spite of relatively unfavorable load factors. Peak loads run up to 2,000 kw., but after the shoe factory — the largest single consumer of power — shuts down for the night and commercial and residential use drops off from evening peaks, the load goes as low as 450 kw.

With these load conditions, standard procedure is to operate one of the Worthington units carrying the base load in company with one of the older oil-burning engines to handle the daytime and early evening swings. As the load drops off after midnight, the oil-burning unit is shut down and the load is carried on the more economical dual fuel unit. This means using a large engine for the small load with resultant poor load factor, but the Worthingtons are efficient at partial loads and the differential in fuel costs makes it profitable to use the dual-fuel engines.

On alternate days, different combinations of engines are operated so that at the end of each month each unit has carried a load proportionate to its capacity and to its economy of operation.



● **OPERATING on natural gas, these engines are saving $11,700 per year.**

UNDERGROUND WATER POLLUTION by OILFIELD BRINES

● BRINE overflowing from 50-ft. deep disposal well; brine tank in rear.

NOTE — In California, control of underground water pollution, as well as that of surface streams, is a function of regional water pollution control boards. The polluted well described herein, located within the Los Angeles region, was the subject of an investigation and report dated March, 1953, conducted under the general supervision and direction of the Executive Officer of the Los Angeles Regional Water Pollution Control Board. At its regular meeting held on April 30, 1953, the Board approved the report and directed that the recommendations contained therein be carried out. In view of the importance of the underground water reserves in this region, an industrial waste survey is being made of the entire industrial area in which the polluted water well is located. This article is published with the approval of the Los Angeles Regional Water Pollution Control Board.

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MUCH has been written on the pollution of surface streams by sewage and trade wastes. It is often found that when a running stream is affected, correction by self-purification can be attained in a short time simply by removing the source of pollution. But when highly mineralized wastes reach ground water the effects may be felt for a decade or more, and the affected waters may never regain their original qualities. Particularly in arid regions is correction slow and essentially beyond the control of man.

A Southern California oilfield has been in production for thirty years in the vicinity of Torrance. As the wells grow older they produce increasing quantities of connate brine with the oil—small amounts at first, but in some cases approaching the quantity of oil produced. A typical brine contains 11,000 ppm of sodium ion and 17,000 ppm of chloride; and has a characteristic musty organic odor. With total dissolved solids of approximately 30,000 ppm, the mineralization of connate brine is comparable with that of sea water. To avoid the handling and storage of this additional fluid, the tendency is to dispose of brine as near as possible to the point of production. Where adequate capacity is available these wastes are often acceptable in public sewers having ocean disposal, after skimming of oil, cooling, and straining through excelsior or straw. Many oil wells, however, are in isolated areas, far from any centralized means of waste disposal. For large numbers of wells under the control of one firm, waste collection and pumping systems may be economically feasible, sometimes utilizing suitable abandoned oil wells for re-injection of brines into oil sands below fresh water levels. Among the smaller operators, however, it has been common practice in the Torrance field, as in many others, to dispose of brine from remote wells into or upon the ground, either by means of earthen sumps or drainage holes, or by dumping directly on the ground. An instance in which such a disposal operation unmistakably polluted a water well is related below.

Water Well Pollution

Two oil wells, drilled in 1937, began producing appreciable quantities of brine in 1942—approximately 1500 barrels per month. Four additional wells in the vicinity produce nearly 900 barrels per month. Since 1942 all brine from these wells has been discharged, first into an unlined earthen sump, then into a 36-in. diameter rock-filled seepage hole 50 ft. deep, and in some cases onto flat ground. Assuming a combined rate of 2400 bbls. of brine produced per month from 1942 to 1953, the total dissolved solids returned to the ground in the eleven years is a staggering 3,393,000 lbs. Since all well logs show a clay or sandy clay layer above the uppermost aquifer of usable water it appears that under natural conditions these salts, principally sodium chloride, would be deposited in the upper ground layers in the vicinity of the disposal points.

In July, 1950, a 277-ft. water well was drilled by the cable tool method into a producing zone of gravel at 250 ft. only 175 ft. from a brine disposal sump. The well was used for irrigation, stock watering, and domestic purposes on the owner's

10-acre parcel. Early in December, 1952, hydrocarbon odor and salty taste were noticed in the domestic supply. The taste and odor became so pronounced that calves would not drink the water. Presence of a heavy brown precipitate (iron) also made the water unsuitable for bathing or laundry use.

Following notification by the State and local health departments, the Los Angeles Regional Water Pollution Control Board sampled the well, finding up to 10,000 ppm chloride, 20 ppm iron, and a strong hydrocarbon odor in the well water when first pumped. Continued pumping caused dilution of these constituents to acceptable levels, but high concentrations would reappear after shutdown. Analyses of brine from the nearby brine sump, and water samples from the well, showed conclusively that brine was reaching the well through underground seepage.

Corrective Action

Recommendations of the Regional Board's report were:

1. With respect to the water well it is recommended that: (A) If the well is to continue in use, the casing must be thoroughly sealed against brine leaks into the ground water strata; and (B) If the well is not to be used, it be abandoned by methods which will effectively seal off all interconnection between underground water bearing zones.

2. With respect to disposal of wastes in the vicinity of the water well, it is recommended that methods be found for disposal of oil well brine other than by leaching into the ground.

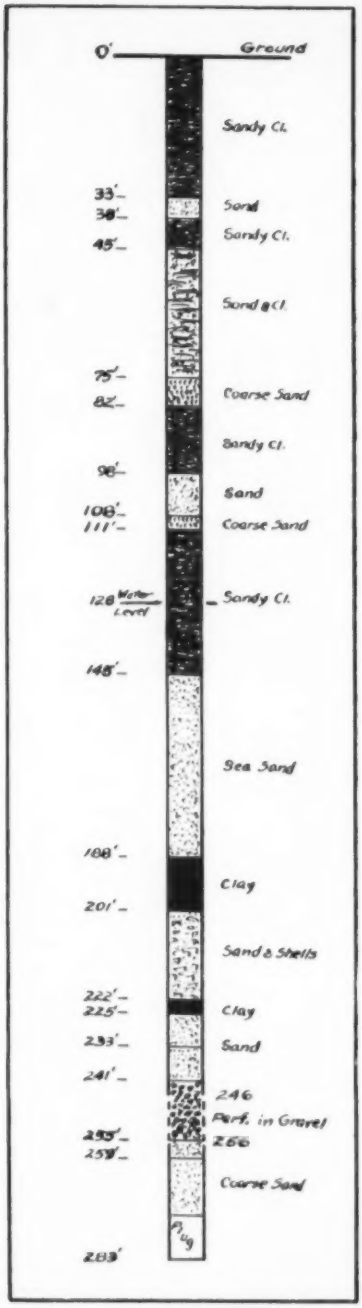
3. With respect to the overall problem, a waste disposal survey of the Torrance oilfield is recommended in order to determine the magnitude of water pollution sources in this area of high groundwater use.

In September, 1953, the water well was abandoned by filling the casing with silt, clay, and concrete. No breaks were observed in the well casing, nor was there evidence of brine dripping down the inside of the casing. It may logically be assumed that brine seepage was occurring downward along the outside of the casing, or through other breaks in the clay strata. Arrangements have been made by the major discharger to dispose of future brine into a recently completed sewer having ocean disposal. Inasmuch as public and private water wells draw from the affected basin, an overall waste survey of the entire oilfield has begun.

Even though corrective measures have been taken at this late date, the long term threat of continuing pollution of the underground basin remains. Contrary to popular opinion the dissolved salts are neither filtered out nor chemically changed by passage through the soil. Thus the nearly 3½ million pounds of salts discharged over the eleven-year period by only a few oil wells lie somewhere in the soil. Only time will tell whether this potential pollutant will find its way down to water bearing zones with percolating rainfall, or remain suspended by one or more clay barriers. One conclusion is reasonably certain; if increasing mineralization occurs in groundwaters of this basin the increase will be essentially beyond control. Fortunately many oil producers have recognized the problem and have taken steps to avoid discharge of brine into the ground. California water pollution legislation enacted in 1949 requires any person proposing to discharge sewage or industrial waste, other than into a community sewer, to file a report of such discharge with the appropriate regional board. After review of each case the board sets requirements for the disposal, based upon the beneficial use made of the affected water. Depending upon the specific location and waters affected, the boards may specify *the nature* of the discharge with respect to conditions in the receiving water or disposal area. The boards *may not* specify the type or design of facilities for meeting the requirements.

Indications that brine passed through the clay strata by seeping downward along the outside of the water well casing point to need for review of water well drilling practices. Proper sealing of the casing as it passed through each clay layer might well have plugged the leak which now serves as an interconnection between the heavily mineralized upper layers and the deeper water bearing zones.

Summary—Unquestioned mineral pollution of a 277-ft. water well has been traced to disposal of oil well brines into and upon the ground in the Torrance oilfield of Southern California. Saturation of the upper ground strata with brine apparently led to seepage of brine along the outside of the water well casing into producing aquifers below. Loss of this one water well is perhaps not serious in itself. The important lesson to be learned is that a tremendous *potential pollution* results from deposition of saline oilfield wastes into porous soil structures. Puncture of underlying impervious layers may release such brine into fresh water aquifers below, as in this instance. Those responsible for the quality of underground public water supplies may wish to review the disposal of oilfield wastes and consider standards for proper water well construction within their areas.



● **LOG of the well discussed in this article. Later this was sealed off to prevent further contamination.**

ELECTRONIC WITCH
Takes Guesswork out of
PIPE FINDING

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WITCHING is by no means a dead science. Every pipe line or utility company has its quota of believers and practitioners of this 7000-year old ancient science. Each of these believers is willing to offer conclusive testimony to the effect that either he or some close friend of a friend can easily and positively witch the location of buried pipes. All that is needed is a forked willow wand, a bent coat hanger, a pair of welding rods, or some other equally simple article plus a certain sensitiveness on the part of the operator to "vibrations" put out by the pipe. In every case the instrument—to use the term loosely—merely indicates or notes the reception of these vibrations by the operator. The violent downward plunge of the willow wand, the swinging apart of the brass welding rods, the downward swing of the bent coat hanger all point directly to the concealed pipe. To indicate any degree of skepticism or even possible disbelief in this method in the presence of the believer is indeed a great heresy. To its practitioners and believers witching is a religion and as such is not subject to argument.*

Your author does not personally believe in or attach scientific significance to any of the dowsing or witching phenomena. However, he has encountered so many staunch believers in the course of his work that he has become rather tolerant on the subject. The reader, however, is referred to the book "Psychical Physics," by S. W. Tromp, 1949. The sub-title to this book describes the text as "A scientific analysis of dowsing radiesthesia and kindred divining phenomena." Mr. Tromp after a detailed scientific study of the subject reaches the conclusion "that divining phenomena are not due to charlantry and suggestion but really exist and that the number of people sensitive to these phenomena is greater than is usually assumed; . . . that these phenomena can be explained by the normal physical and physiological laws."

Nevertheless, in spite of the "proven" ability of the witching fraternity there are bound to be some who are disbelievers. Further, there are perhaps companies or municipalities who do not have the ready services of a witcher. And there even may be a few jobs too difficult for the most expert witcher.

Modern scientific electronic pipe finders do not depend for their functioning on any unknown or otherwise intangible properties. They are straightforward instruments that have undergone steady and consistent improvement since their development some twenty years ago. Basically, such a unit consists of a portable directional radio type transmitter used in conjunction with a portable radio-direction-finder type receiver. The transmitter induces an electromagnetic field either inductively or conductively into any buried metallic object within its range. The location and depth of the buried object can then be determined by detecting and studying this induced elec-

● **PIN-pointing the position of a buried pipe line. Receiver is moved by operator to find line.**

● **OPERATOR is searching the area for unknown and unlocated lines in advance of trenching work.**

tromagnetic field with the directional receiver. The two principal components, the transmitter and receiver, can be operated as a single unit through the use of a connecting wooden handle. The majority of applications, however, employ the transmitter and receiver as separate units.

What are some of the practical field uses for this type of equipment? To state merely that the equipment can be used for locating buried pipes, cables, and miscellaneous objects can in no way convey the full use and value.

When a pipe or cable is buried and the overlying ground has had a chance to resume its normal appearance, that line, even with good records, can be considered as practically lost. By the time a few years have passed and the original employees have moved on, retired, or been transferred the line really becomes lost. Multiply this by the fact that in many communities in the United States more and more lines have been buried in the same area at intervals for well over a hundred years. The building of new industrial facilities, refineries, subdivisions, and other modern developments merely complicate an already confusing situation.

The location of single pipes is an exceedingly simple operation with the modern pipe finder. Yet this can be of great value to the trenching machine or site excavator. The main telephone cable for the entire area immediately north of San Francisco was recently broken by a bulldozer excavating for a new industrial site. As a result several large communities were without connecting service for a period of twenty-four hours. The telephone company had been asked to stake their line in advance of the excavation. This was done from the company right-of-way maps. Nevertheless when activities actually got underway the bulldozer blade found the cable some twenty-five yards away from its staked location. A quick reconnaissance with the pipe finder would have advised both the telephone company and the contractor of the true location of the buried conduit.

It is where many parallel and adjacent pipes are present in a confined area that the pipe finder really becomes of extreme value. By selectively energizing each of these multiple lines in turn it is possible to trace out the surface projection of every line in the area. This is made possible by directly connecting the transmitter unit by means of a small cable and clamp to the desired pipe. This pipe alone is energized by the transmitter. The receiver is then used to trace out its position. Careful work with this method can usually untangle the most difficult snarl of buried pipes.

Isolated metal objects such as manhole covers, buried storage tanks, or other facilities can be located quickly and even their exact centers determined. For this application the transmitter and receiver are coupled together and used as a single unit. Once the approximate location of the buried object has been established it may be pin-pointed with the following procedure. While standing approximately over the object the operator slowly rotates the instrument through a complete horizontal circle of 360°. If the operator's feet are directly over the concealed object the meter reading and headphone will remain at a maximum for the full circle. If the operator's feet are not directly above the object a fluctuating signal will be observed as the instrument is rotated through the circle.

The increasing use of plastic, cement, and other non-metallic pipes indicates that survey records will have to be kept with much greater consistency and accuracy than in the past. If this is not the case future workers will have at best a difficult time in re-locating these lines. The Navy has suggested a method of increasing the locatibility of non-metallic pipe lines. At the time the pipe line is laid, salvage copper wire is laid adjacent to the pipe. This wire is brought to the surface at valve boxes, terminals, or other outlets. Future operators can readily locate the buried portions of the non-metallic line by tracing the position of the copper wire. Another method that has been used to locate non-metallic sewer lines in the past is to insert a steel cable into the line at some known location. The cable is energized by direct connection to the transmitter and its position traced with the receiver. This method is not suitable in those cases where the operator is using the pipe finder to search an area for unknown non-metallic lines.

Other common applications for pipe finding equipment include determining the depth of a pipe or conduit, locating laterals or stubs, locating the end of a pipe or cable, and locating valves, valve covers, tees, and risers. Still another application is in locating points of obstruction in clogged non-metallic sewer lines.

It must be conceded that even the most expert witcher is no match for a modern electronic pipe finder. It can perhaps be said that since the pipe finder is not dependent for its functioning on the operator's possession of any supernatural powers that here is science's contribution to this ancient art. The pipe finder is indeed every man's electronic witch.

• • •

Factors in Pruning Trees Along Highways

Trees that are too near the highway are a hazard. There is some danger from branches falling during a storm; low branches weighted by ice or snow may interfere with traffic; falling leaves during fall rains may cause slippery spots; shady spots become icy patches under some winter conditions; and there are often some problems with utility line location and maintenance. The problems arising from these factors were recently discussed by Dr. R. P. Marshall before the Highway Research Board. Careful pruning and maintenance procedures are the answer.

In pruning it is usual to work from the top down, except for the removal of branches that may impede the work. Unless bleeding prevents, immediate application of wound dressing to flush cuts is desirable. General procedure is recommended as follows: Removal of dead wood and broken branches that grow straight upward or turn back toward the center of the tree; thinning out interfering and closely parallel branches; and cutting out suckers.

• • •

Purdue Traffic Control Conferences

The second annual conference on Road and Street Traffic Control, will be held at Purdue University, Lafayette, Indiana, April 22 and 23, 1954.

● FIRST successful crawler type tractor, built by Holt, and tested at Stockton, California, Nov. 4, 1904.

● HOLT crawler type, 5-ton tractor and early bulldozer in use at the Indianapolis, Ind., city dump during 1923.

FIFTY YEARS OF DIRT MOVING

FIFTY years ago it cost around 20 cents to move a yard of dirt; it costs more today, but not very much more. Dirt-moving costs have gone up less and slower than the costs of any other construction item. The crawler tractor is basically responsible for this because its adaptability to all-around use has permitted the invention and development of scores of cost-saving devices. Caterpillar Tractor Co., which is conducting a commemorative program with the theme "50 Years on Tracks," has sent us historical data from which we have taken the following:

Around the turn of the century there was a growing need in California for compact power that would ride high on the soft delta lands to haul the huge agricultural machines of that day. Both Benjamin Holt, president of the Holt Manufacturing Company, and Daniel Best, president of Best Manufacturing Company, had been making steam traction engines since about 1890. They attacked the soft soil problem by adding larger and larger wheels to increase the bearing areas of their machines. One Holt unit had three six-foot-wide wheels on either side which stood seven and a half feet high. Some of these monsters weighed as much as 40 tons. They provided the necessary power and rode well up on the soft earth, but they were awkward to maneuver and practically impossible to transport.

In his quest for a more compact unit that wouldn't mire down so easily, Holt tried a new approach. First removing the wheels from one of the standard steam models his company was making, he substituted rough tracks. The result was the first commercially successful track-type tractor which was tested on November 24, 1904 in Stockton, California. It was about this same time that the Holt Company originated the trademark "Caterpillar" and soon applied it to many of its products.

Holt continued to improve on the track-type tractor. In 1906 he was the first to put a gasoline engine in a crawler, thus streamlining the unit considerably. In 1913 Holt was one of the first to come out with an all-track model or "muley". In 1908 he bought the Best Manufacturing Company from Daniel Best, his chief competitor in the steam traction engine and combine market. However, in 1910, C. L. Best, son of Daniel, organized the C. L. Best Gas Traction Co. to manufacture gasoline driven wheel-type tractors. In 1913 Best came out with his first track-type tractor and the competition between the Best and Holt interests became particularly keen. This continued until the two companies eventually merged in 1925 to form the Caterpillar Tractor Co.

The first crawlers were essentially farm tools, but they quickly moved into many other fields. During World War I, the track-type tractor inspired the design of the first tanks. Also, the crawler became the first standard U. S. artillery tractor. Thousands of these units hauled artillery, supplies and personnel across the battlefields.

After the war, in company with multiple steel-wheeled wagons and scrapers of that day, the crawler displaced the horse as the nation's number one earth-mover. A revolutionary move in the crawler tractor field came in 1931 with the introduction of the diesel-powered tractor which set the trend for the present day crawlers.

In World War II, the crawler-mounted bulldozer became symbolic of America's productive might. It went into all theatres of war and performed many essential jobs. The track-type tractor was considered more valuable than tanks in some theatres. It frequently went in with early invasion troops to fill bomb craters, destroy pillboxes, clear debris and jungle and carve out airports and roads, even to the 1700-mile Alcan Highway. (Read Ed. Cleary's "Bulldozers Come First.")

W. K. Cox, of Caterpillar, speaking of the 50-year program, says: "We believe this is a significant milepost, because the crawler has played such an important role in the progress of our nation in both peace and war. During this half century it has been instrumental in the development of modern methods in the construction, logging, mining, oil and agriculture fields, which affect all of us in one way or another."

As the track-type tractor has progressed through the years, new tools have been developed to work with it — wagons, scrapers, bulldozers, pipe layers, rippers, front-end shovels and a great variety of agriculture equipment. And it has still more jobs to do.

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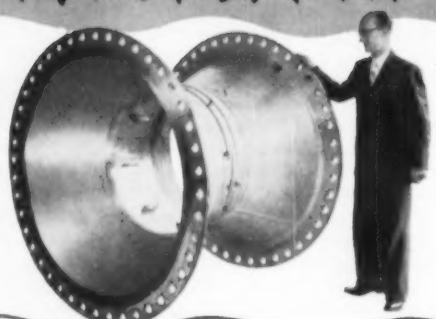

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Backhoe Speeds Up Transplanting of Trees

AS a basis for landscaping property surrounding a drive-in theater near Birmingham, Mich., it was necessary to dig up and transplant 250 small trees. A Sherman backhoe-type digger was used by

the contractor, Patton Trenching of Detroit. In an 8-day period the 250 trees were dug up, moved 15 miles and replanted. The holes in which they were placed were also dug by the Sherman equipment. One man only was required for the uprooting and hole-digging operations.

• • •

Curb and Sidewalk Built Faster with Special Machine

TO construct some 12 miles of 24-in. rolled curb in the Pueblo Gardens Improvement District of Tucson, Ariz., Pioneer Constructors of that city used a Dotmar curb and gutter paver. It took as few as three men to do the work. The same machine was also used to lay concrete sidewalks, and on this work it could operate at rates as high as 10 lineal feet per minute. Concrete was deposited ahead of the Dotmar machine by a transit mix truck.

● **FAST work on curbs and sidewalks.**

TYPICAL PAVEMENT MODERNIZATION

R. A. HABER, Formerly Chief Engineer, Delaware Highway Department

WIDENING and rehabilitation of the existing highway system is one of the primary jobs facing the Delaware State Highway Department. In a total of 4,000 miles of roadway almost a thousand miles are in need of widening and resurfacing.

As an example of the type of work being done, the Department has built from Summit Bridge to Tybouts Corner, a distance of 7.061 miles at a contract price of $486,-363.00, a 4 inch cement concrete widening of 8 inch uniform thickness together with a 3 inch hot bituminous concrete surface. This original roadway was built at a 16-ft. width in 1924 with a 6-8-6 section and in those days was adequate for both the traffic and the width of vehicles. However, by 1936 it was necessary to place a 4-foot wide strip on one side to give a safe passing width of twenty feet; this widening strip was 8 inch thick uniform pavement. At that time the surface was not in need of repair since the total weight and number of vehicles had not caused deterioration of the original pavement. Now, with the present-day roadway usage, it has been necessary again to widen with a 4-foot strip on the other side of the original pavement and cover the entire 24-foot surface with a 3-inch. bituminous wearing course.

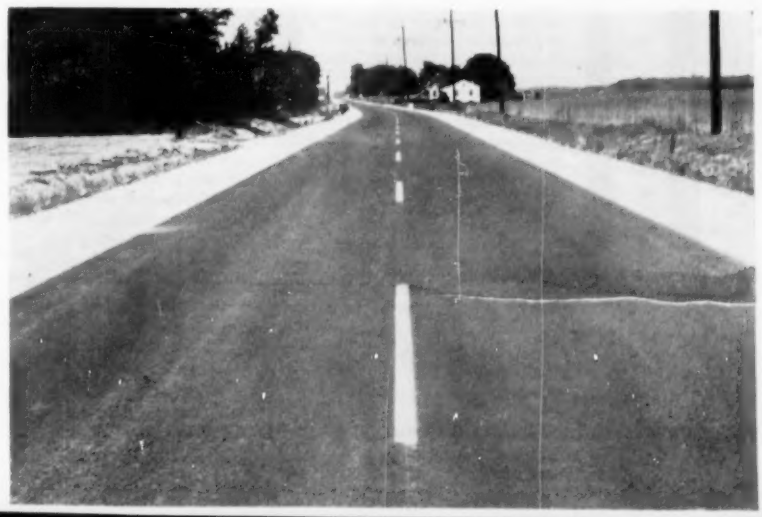
In placing the widening, trenches were excavated alongside of and parallel with the existing pavement and the subbase was compacted by the use of rollers under the assumption that traffic over the years has provided sufficient compaction to assure a fairly stable subgrade. This theory has been borne out in many cases because of our fortunate soil conditions in which sand-clay predominates. Selected material was added at locations where soils were obviously unsuitable. The widening strip was poured continuously with cut joints being placed opposite major cracks in the existing pavement. These cut joints are a minimum of 2 ins. in depth and were poured with a joint sealing compound. No dowels were used.

The bituminous riding surface was placed in two courses: a base course 1¾ ins. thick using maximum 1¾-inch stone and a surface course 1¼ ins. thick using maximum 1¼-inch stone. The work done under this system has proven economical and provides an excellent highway for today's needs with an expected life of fifteen to twenty years.

The work on this particular contract was done by the Standard Bitulithic Company, Delaware Branch, with Richard N. Raultson, Superintendent. Robert Wetherall is Division Engineer for the State Highway Department, Fred Schlor is Resident Inspector for the State Highway Department.

● **EXCAVATION** for additional width of concrete along old narrow concrete road.

● **NEW** concrete has been placed in the trench thus widening existing pavement.



● **FINISHED** improved highway with new bituminous concrete surface.

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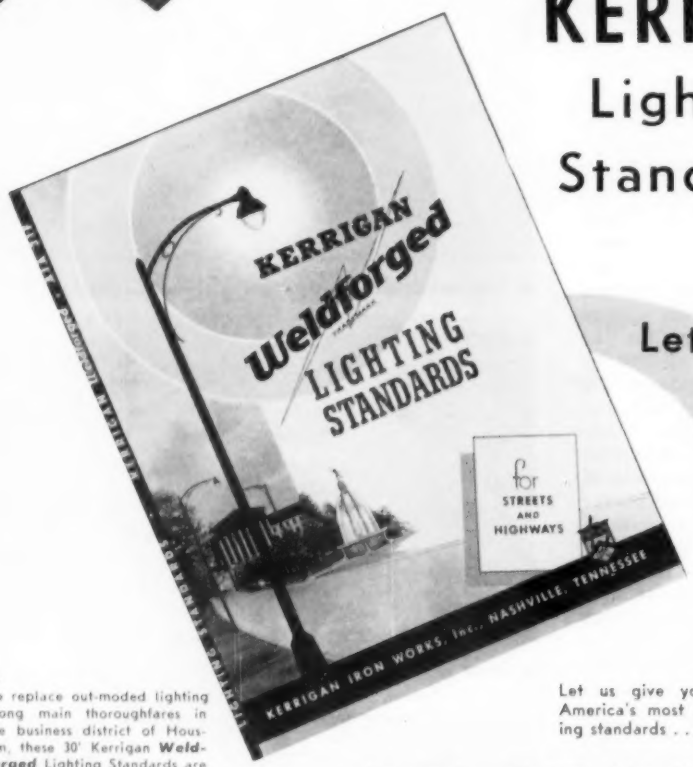
Lighting Standards



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APWA News

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APWA Study Shows Practices in Time-of-Completion Provisions of City Construction Contracts

Many Contracts Specify Time Limits and Require Liquidated Damages for Failure to Finish Work

CHICAGO, Ill.—One of the responsibilities of city officials is to minimize the losses to business and the inconvenience caused the public when major improvements are undertaken which involve the temporary obstruction of street traffic. The most common practice followed to expedite the completion of city construction projects is to include in the contract provisions specifying the time allowed for completing the work and the amount of liquidated damages that the contractor shall pay to the city if the contract is not finished within the time specified.

It is customary, however, to authorize some official—usually the director of public works or the city engineer—to grant extensions of time to complete contracts which are delayed for certain reasons beyond the control of the contractor. Some cities, however, consider it good practice to limit the period for which extensions may be granted by any individual to a relatively short time. New York City, for example, limits the power of the Commissioner of Public Works to grant extensions to 60 days. Extensions of time in excess of sixty days may be granted only by a Board consisting of the Commissioner, the Corporation Counsel, and the Comptroller or their duly authorized representatives. In Houston, the contractor is required to file his request for an extension of time with the city engineer who then presents it to the city council with his recommendation for action. A similar procedure is also followed in Green Bay, Wisconsin.

Liquidated damages have been defined as a sum agreed upon in advance by the parties as compensation for a breach of contract. Sums such as a jury would award when a case is presented upon its own merits are considered unliquidated damages. It is significant to note that there is a difference between a penalty and liquidated damages. The basic difference is that the amount which can be recovered in a suit under a penalty provision is not the sum named as such, but only the actual damages sustained. Liquidated damages, however, are assessed as the sum agreed upon by the parties to the contract because it would be impractical and extremely difficult to fix the actual damages. This basic difference is recognized by many cities such as: Oklahoma City, Evanston, Fresno, Oakland, Columbia, Norfolk, Portsmouth, Brookline, Fort Worth, Camden, Durham and New York who have specifically stated in their contracts that the sums agreed to as liquidated damages shall not constitute a penalty. It should also be noted that liquidated damage provisions of city construction contracts of Baltimore, Md.; Dayton, O.; Trenton, N. J.; and other cities have been upheld by the courts.

Over 50 percent of the 232 cities in the United States of over 50,000 population recently responded to a survey conducted by the American Public Works Association to determine the extent to which cities utilized such provisions in their construction contracts. Results of the survey are summarized in the Association's February Newsletter. Approximately 50 percent of the 121 cities reporting indicated that they customarily specify in their contracts the *number of days* within which the work is to be completed. About 12 percent report that the provisions of their contracts require completion by a *specified date*. About 29 percent of the cities reporting utilize both methods of specifying the time allowed for completing the contracts. The remaining 9 percent indicate that no provision is included in their contracts specifying the time within which the work is to be completed. Two of these, however, state that the contractor must indicate the time within which he can complete the work when he submits his proposal, and is thereafter required to pay liquidated damages if he is the successful bidder and fails to complete the contract within the stipulated time. It is significant to note that approximately 25 percent of all cities reporting indicate that provisions are included in their contracts limiting the time for completing the work, but not requiring the payment of liquidated damages for failure to complete the contract within the time specified. These cities presumably follow normal court procedures to recover unliquidated damages if the length of the delay in completing

(*Please turn to page* 102)

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CASEY APPOINTED TO HEAD 1954 CONGRESS

Will Be General Chairman of Local Committee at Atlantic City

LOS ANGELES, Calif.—Recently announced by APWA President Milton Offner was the appointment of Major William F. Casey as general chairman of the 1954 Public Works Congress Local Committee. Major Casey is Commissioner of the Department of Public Works in Atlantic City.

Named by Major Casey to head subcommittees in the local arrangements for the meeting to be held in his city September 19-22, were Fred M. Herrick, Superintendent of Streets, Atlantic City (Management Staff); George R. Swinton, City Engineer, Atlantic City (Inspection Trip and Transportation); John S. Flockhart, Chief Engineer, Department of Public Works, Newark (Entertainment); Edward P. Decher, Secretary and Purchasing Agent, Joint Sewer Commission, Newark (Reception); Paul R. Screvane, Director of Operations, Dept. of Sanitation, New York City, and Henry D. Harral, Commissioner, Dept. of Streets, Philadelphia (Exhibits); William S. Foster, Engineering Editor, American City Magazine, New York City (Publicity and Public Relations); Daniel Moltz, Assistant Manager of the Atlantic City Convention Bureau (Housing); and Mrs. William F. Casey (Ladies). Future issues of the APWA News Letter will report committee progress and program details.

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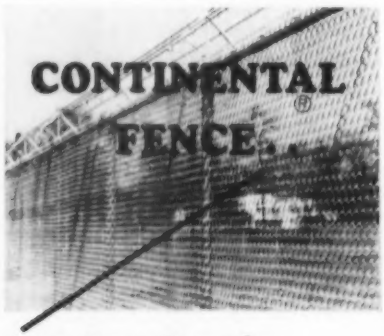

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Discussion Held on City-State Highway Relations

OAKLAND, Calif.—C. E. Bovey, Engineer of City and Cooperative Projects for the California State Department of Public Works, told members of the Northern California Chapter that "teamwork" is the key to the solution of city—state highway problems. Approximately 60 members and guests of the East Bay area were present at the February meeting to hear Mr. Bovey discuss how the 314 cities of California share the 5½¢ per gallon gas tax which is annually allocated to the cities of that state. The present yield from this portion of the states 6-cent tax is about $24 million.

Mr. Bovey stressed the necessity for cooperation between cities, who prepare the plans, specifications and reports and supervise the construction projects, and the State Division of Highways who administer the funds through the eleven district offices. He pointed out that this fund is allocated in accordance with population and that more than one-third of the cities have called for special census counts which have resulted in an average gain in population of about 14 percent. He also noted that the amount of funds available for distribution vary with the consumption of gasoline (or tax paid) and not with population. This means that some cities, by having a special census taken, are able to increase their allocations while the allocations to the remaining cities are correspondingly reduced.

Some groups such as the local chapter, he suggested, should undertake a study to find a more rapid and less costly method of adjusting the allocation of funds to account for the rapid increase in population of the various cities throughout the State. The cost of conducting a special census was estimated at 15¢ per capita.

The current policy followed by the State Division of Highways he said, is to classify resurfacing as maintenance where the thickness is 1 inch or less; and as new construction where the thickness is 1½ ins. or more. Thickness of pavement between 1 inch and 1½ ins. is classified either as maintenance or new construction in accordance with the specific job requirements. Mr. Bovey also reminded city officials of the standards that must be observed if streets are to be included in the City's Major Street System. Such streets, he explained, should be able to meet the minimum design standards of 12-ft. moving lanes and 8-ft. parking lanes. In his concluding remarks he commended the chapter for its work in establishing minimum street design standards for the cities of that area.

Time-of-Completion

(*Continued from page* 101)

the contract is of sufficient duration to warrant such action.

Approximately 63 percent of the 89 cities that indicated the use of liquidated damage provisions in their contracts reported the usual amount of such damages as are stipulated in their contracts. The amounts customarily specified were: $50, $25 or $10 per day for each day's delay in finishing the contract. Other cities reporting indicated that the amount varies from $10 to $600 per day depending upon the nature and amount of the contract. As would be expected, special consideration is given to exceptional cases, such as, a recent $5 million contract for vehicular tunnel in San Francisco, where the liquidated damages were set at $500 per day for each day's delay in completing the contract. The practice of awarding bonuses for finishing projects ahead of the completion date is not generally used. Only two cities indicated that liquidated damage provisions were not included because of the fear that they would tend to increase the cost of the work.

Other methods utilized to expedite the completion of construction contracts are to require that the successful bidder furnish a surety bond and a detailed schedule showing the sequence of the work to be performed. Some cities such as New York, Fort Worth, Durham, Oklahoma City and Columbia require such schedules and/or specify in the contract that the city engineer may require the completion of certain parts of the work before other parts are undertaken so that it will tie in with allied projects or otherwise minimize the time that streets are obstructed to traffic.

• • •

LaDue Represents APWA on Employee Safety Committee

WASHINGTON, D. C.—The President's Conference On Occupational (formerly Industrial) Safety will be held in Washington, D. C. May 4-6, 1954. It will be conducted under the direction of a Conference Coordinating Committee established by the Bureau of Labor Standards of the Labor Department. Its basic purpose is to save human life and limb and to promote accident prevention in governmental and industrial activity.

A special Committee on Public Employee Safety has been oreated to develop an action program designed to reduce the tremendous losses resulting from injuries to governmental employees. Wendell R. LaDue, Chief Engineer and Superintendent of the Bureau of Water and Sewerage of Akron, Ohio has been selected to serve as the official representative of the APWA on this important Conference Committee.

Plan Now for Your Trip to Atlantic City Congress September 19 - 22

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association.

A CLEAR pattern on the use of public works begins to emerge as one reviews the recent statements of top Administration officials. In November, 1953, Dr. Arthur Burns, Chairman of the President's Council of Economic Advisors told the American Assembly Conference on Economic Security that large scale public works were being planned as one of several stand-bys against a possible depression. He indicated that considerable progress had been made in blueprinting such plans to cushion a downturn in the economy.

In December, 1953, Presidential Assistant Sherman Adams told the 30th Annual American Municipal Congress that "Should the Congress decide that an accelerated public works program is desirable, authorize such a program, and provide the funds, the Administration will be in a position to move fairly rapidly . . ."

In his State-of-the-Union message of January 7, 1954, President Eisenhower hinted that public works would be used as an anti-recession device. He said that our transition from a wartime to a peacetime economy demands "public works plans laid well in advance". Again, in his budget message of January 21, 1954, the President told the Congress that "To encourage State and local governments to prepare for possible future expansion in public works construction, I am recommending legislation to authorize Federal advances to them for planning future construction. If the authority is granted, I shall request a supplemental appropriation for the fiscal year of 1954 of $10 million, with estimated expenditures of $3 million in 1955."

The President's Economic Report to the Congress of January 28, 1954, states: "Our public works programs should be so designed and executed as to contribute to economic stability, by being accelerated in slack times and restrained in boom times. Within limits, expenditures for public works can be timed to serve the interests of stability, but only if a reservoir of engineering studies and blueprints for specific projects has been prepared well in advance of need. . . . If it should become necessary, outlays for Federal public works could be stepped up by one-half or more within a year. State and local outlays, which are now the highest on record, might be expanded to a similar extent, if financial arrangements were adequate. . . . the Federal Government should be prepared, in case of serious need, to cooperate with State and local governments. To assist localities in building an inventory of drawings and specifications for high priority projects, it would be desirable to make interest free loans for this purpose."

In his February 10, 1954, press conference, Mr. Eisenhower gave Administration blessings to H. R. 7818 which would boost the Federal aid highway program from $575 million to $875 million, annually, for the next two fiscal years.

From these developments Washington observers see public works being used to halt a downslide. For the present, interest-free loans to make advance plans for high priority projects will be authorized. For the future, if unemployment becomes acute, Federal financial assistance will be given for direct participation on public works programs.

Highway Legislation

H. R. 7818 has been introduced as the Administration's Federal Aid Highway Act of 1954. The bill calls for a Federal-aid highway program of approximately $875 million for each of the next two fiscal years. This compares with $575 million per year currently authorized.

Features of interest of this bill are: (1) The annual appropriation for urban road work for each of the next two fiscal years will be $150,-

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000,000 as compared with $137,500,000 under the 1952 Act; for secondary road projects $180 million in place of $165 million; and for primary road work $270 million in place of $247.5 million.

(2) There will be a $200 million appropriation for each of the next two fiscal years to be expended on the national system of interstate highways. This $200 million will not be distributed according to the usual formula based on road mileage, population and post roads. One half of the amount will be distributed to the states in the ratio which the state bears to the total population of all states. This will, of course, benefit urban areas.

(3) The Bureau of Public Roads is authorized to undertake a study into the problems posed by the relocation of utilities resulting from highway improvements.

S. 2859 has been introduced by Senator Case (R-SD), chairman of the Senate Public Works Committee's subcommittee on Roads. This bill authorizes $200 million per year for each of the next two years for urban road work, with $65 million earmarked for by-pass work; $100 million for the interstate highway system distributed on a 60-40 basis; $50 million for civil or military defense circumferential or radial intracity routes, with funds distributed on a 60-40 basis; and a Bureau of Public Roads study of Federal-aid for toll roads. Total authorization of S. 2859 is $800 million, for each of the next two fiscal years.

Early Congressional action on this important legislation is expected. The bills are pending before Public Works Committees in both Houses. President Eisenhower in his press conference February 10, 1954, endorsed the proposals and said he was in favor of returning for highway use approximately the amount collected in motor fuel taxes—about $910 million annually.

Companion bills, senate and house, have been introduced to create an Office of Public Facilities Administrator and to establish a working program for the planning and construction of public works. The bills authorize the establishment of a Public Facilities Administrator in the Executive Office of the President. The idea of the bills is to provide a means whereby the Federal Government can more effectively take advantage of available manpower to develop needed Federal public works projects and to plan needed public works to contribute to the nation's economy to offset declines in private investment. The Administrator would be required to submit an annual report to the President containing information on the reservoir of public works needed and planned by Federal, state and local governments.

S. 2871 would amend the Small Business Administration Act so as to authorize loans to municipalities, States and other public agencies to aid in financing specific public works projects, if adequate financing for such projects was not elsewhere available. Authorized is a $25 million revolving fund appropriation. The loans would be for a maximum of 40 years. Administration Housing bill, H. R. 7839, contains provision for a ten million interest-free loan fund for advance planning of public works; also five million to HHF; and an Administrator for Urban, Metropolitan and Regional Planning.

• • •

Traffic Volume During 1953

Based on the reports for the first eleven months of 1953, the Bureau of Public Roads estimates that traffic volume on all rural roads will approach 290 billion vehicle miles for 1953.

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Best quality asbestos rope, brass caps attached to each end. Equipped with clamps.

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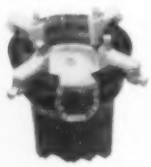
A truly fine instrument designed to solve even the most difficult leak detecting problem.

Calking Tool Outfit

For water mains up to 12". Strong leather bag. Keeps the right tool for every job within easy reach.



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On this page are shown only a few of the hundreds of items to be found in the POLLARD Catalog. Write for a copy of Catalog No. 25A.

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Inexpensive way of cutting pipe. Every wheel in contact with the pipe is a cutting disc, so cutter need be moved only a short distance to cut entirely around the pipe.

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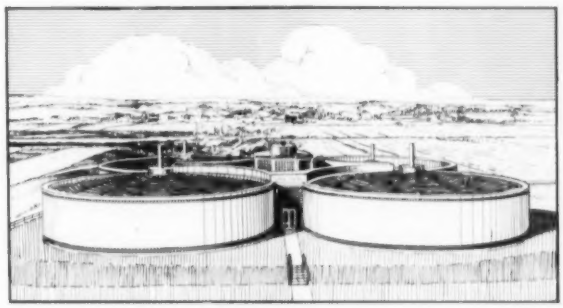
New developments in "controlled digestion"

A STATEMENT OF POLICY



In the development of controls for the separate sludge digestion process, the Pacific Flush Tank Company has been a leading contributor. The P.F.T. Floating Cover was developed to provide means for positive submergence of the scum in the seeding liquor and allow safe gas utilization. P.F.T.'s development of external heating of recirculated digester contents and raw sludge assures the maintenance of constant optimum digester temperatures. And more recently the development of the P.F.T.-Pearth Gas Recirculation System provides a positive means for the rapid dispersion and elimination of scum accumulations.

Our Policy is Clear—With our many contributions to the basic knowledge of the sludge digestion process, it has always been our policy to point out the advantages of closely controlling all factors affecting digestion. With effective controls, operational difficulties are eliminated and successful digestion results—the production of an inoffensive sludge of uniform concentration suitable for ultimate disposal.

We will continue to advocate the use of established design criteria for digestion capacity as formulated by consulting engineers and State Boards of Health. We feel that these criteria are developed to take into consideration practical plant operating procedures and future requirements. These criteria cannot be based solely upon results of pilot plant studies which require careful control by staffs of highly skilled technicians.

The introduction of the P.F.T.-Pearth Gas Recirculating System provides an economical means of dispersing scum accumulations, making the total digester volume available for effective digestion. There is no *mysterious* action in the operation of any gas recirculating system. It is merely a *mechanical* action which aids the normal biological activity by breaking up the scum so that it can be digested.

To those interested in sewage and waste treatment, Pacific Flush Tank Company will continue to offer straight-forward information about all of its equipment and new developments.

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Records and Maps of the Water Distribution System

CLIFTON C. WILLIAMS,
Senior Engineer,
Mobile (Ala.) Water Service System

THE records that you keep on your water distribution system are, to my way of thinking, perhaps the most important records that can be kept by any water department organization. Eleven years ago when I started working with the Water Department in Mobile, we had a water system which had lines that had been laid over a hundred years ago, or part of them anyway; but there had been no records kept on these lines. The Foremen who had worked on these lines were real mechanics and knew the system well, and they kept their records in their heads. Now these men are all buried. In later years there were new Foremen, some that we now have, and these men actually kept a record in a book, but this book was not for the use of the entire Department—Oh, no, the more information he put into his little Black Book the more valuable he was to the Department and the surer he was of holding his job. Gentlemen—Don't let this happen to you.

We have made some progress in the last few years and this is the story of the process we have used to secure what we have.

We first put into use a form which is a Foreman's Daily Job Report. It shows: (1) the location of the job; (2) the size of the line that is to be worked on; (3) the type of line, that is, what kind of joints are in this particular section; (4) the condition of the line; (5) the location of the main, valves and fire hydrants. A space is left for a sketch of the particular job, and if a shut down was necessary, this is shown.

This is a portion of the data presented by Mr. Williams in a lecture at the 1953 Short Course School and Conference at the University of Alabama which was held under the auspices of the State Department of Health.

Then the report also shows what work was actually performed. If the Foreman worked on a fire hydrant, he showed the name of the hydrant; the size of the heel and barrel; whether this particular hydrant had a valve on it or not; and the condition of both the hydrant and the valve. If for some reason he worked on a valve in the main and it was possible to do so, he showed the name of the valve, its size, whether it is right hand or left hand operated, and its condition.

Then he has a few lines for "Miscellaneous." Here he can put anything that will be information about the system, such as the number of turns on large valves; whether the valve goes down easy or not; and the depth of the main.

A description of the repairs that were made is very important. In other words, he should put into this "Description Space" anything that may make it easy for the next man working in this area. Then he should list his crew.

We have found that sometimes you may have to check back to these work sheets—we have lost one of our Foremen since we started

STOP WEEDS
...for lower maintenance costs!

this powerful weed killer can
keep ground bare of weeds and grasses
Highway Commissions and large scale industrial users prefer BORASCU Weed Killer because they know they can depend on the results . . . it's quick and easy to apply; provides long-lasting control at low cost. BORASCU is not only useful for the destruction of weeds and grasses but also for the pre-treatment of asphalt or gravel covered areas to protect against the possibility of weeds breaking through the paved surface and destroying it. Countless parking areas, airport landing fields, and storage areas have been given the protection of BORASCU . . . it's good insurance for any paving job!
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using these sheets but the crew was able to clear up what information we needed.

Now these sheets are made in duplicate. One is turned in each morning and the duplicate is left in the book and kept by the Foreman. The turned-in copy is bound for our easy use.

A set of Maps

At the same time we started making a complete set of maps of the streets that were served by our system. These maps were drawn to scale 1" to the 100'. It was, of course, necessary to index these sheets, so we took a map of the City of Mobile and the outlying areas and laid out the separate sheets on it and numbered them in the upper right hand corner of the 100' scale sheets. Each sheet has a small number on each side; these small numbers refer to the sheet that matches that side.

When we were pretty well under way with our skeleton maps we would take one and go into the field and get all of the information that was visible—fire hydrants, valves, meters—anything pertaining to our Water System—and we put this information on the sheet.

Then the real work started. We would shut down a fire hydrant—any one. Sometime it would take a lot of valves but we would shut it down, and each valve that was closed was listed.

After the hydrant was shut down we would start opening the valves that we had closed, one at a time, and when a valve was opened and we didn't get water to the hydrant we would shut it back down and record it on the shut and then we would try another, and in this way we could determine finally the valve to shut for that particular hydrant.

Then we started taking larger areas that would shut several hydrants and determine the "shut" for each of these hydrants. Quite often we found that several hydrants were on the same "shut." This really involved a lot of work and a lot of time. In our system we have approximately 450 miles of mains and 3277 valves.

After we got one of these sheets pretty well proved out we would have it printed and each one of our Foremen would get a copy—with instructions to check and turn in anything that wasn't like the sheet showed. For a while we didn't get any changes, but before long one of the Foremen came in and said: Mr. Williams, my book shows this different from what you show on your sheet.

Well, I checked, and it happened that it was different, so we corrected it; and while I was doing this, this Foreman told me that there was a lot of information in his book that I might be able to use.

How right he was!

It wasn't long before all the other Foremen brought in their little Black Books, and they had a lot of information in them that we needed. So now with all of us working together we are making progress.

Valves Maintenance Record

A valve is not worth a darn unless it will work when you need it. We make it a point to exercise and oil our large valves; you see, some of our large valves are old and the gears are exposed. These gears are cleaned and oiled and the valve gates are worked up and down to keep the gate slot clear.

As I have said before, we record the number of turns on our large valves. This is done because quite often when you have a break and you close a valve to a point that you think is down, if you will wait

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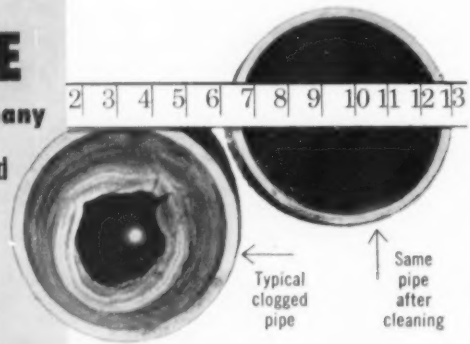
cleans clogged mains for about 1/30 the cost of replacement!



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YOUR PROBLEM: You have a stuffed up main. You're getting less water—at higher cost.

YOUR SOLUTION: You can do one of three things:

1. You can buy bigger, more expensive pumps. However, pipewall deposit continues to build—volume again drops. Now, your pumping costs are really high!

2. You can replace the clogged main. This also is expensive. For example, 10" steel line, 30" underground, costs at least $6.00 per foot wrapped and laid, plus the cost of tees and crosses!

3. **The best solution is: Get Flexible Pipe Cleaning Company to *clean* that clogged main! We'll restore it to 95% new efficiency! It costs you only about 18c per foot—or 1/30th of the cost of main replacement. After cleaning, you can use your present pump, too!**

How much to clean your clogged mains? Send for our Preliminary Job Cost Estimate form. Take five minutes to complete this form and return it to us. We'll give you a free estimate on the cost of cleaning your pipe—stacked, stored or underground.

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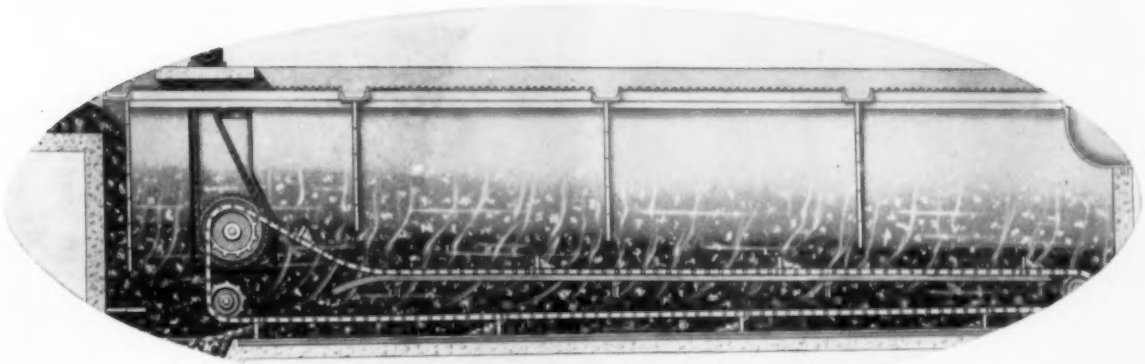

Yes, the unique cellular construction of Rex Verti-Flo that provides maximum practical weir length is now an established, proven principle in clarifiers... proved in more than 20 installations with more going into operation soon! It has more than lived up to our claims ... just check any user. We'll gladly supply the names if you desire.

So, if you're interested in at least doubling your present plant capacity or substantially reducing costs of a new installation, be sure to consider Rex Verti-Flo.

Check these Verti-Flo advantages for your plants:

- **Detention periods ¼ to ½ shorter than those required in conventional tanks... tank sizes ¼ to ½ of those normally used.**
- **Completely adaptable for varying rates of flow.**
- **Virtually eliminates short circuiting.**
- **Provides flexibility of flow distribution.**
- **Allows sludge recirculation.**
- **Maximum clarity of effluent.**

For the complete Verti-Flo story send for your copy of Bulletin No. 52-77. Write Chain Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wis.

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just a few minutes you will find that you can get several more turns on it. The only thing I can figure is that in closing the valve you have forced some of the growth that has accumulated on the valve down into the gate slot.

Usually when we close a valve and we lack several turns on our count, we will open it up a few turns and let it wash out and then close it on down to the true shut point.

Another thing that we have that has made it much easier for us to prepare our maps and records are the pipe locating instruments. We use them to locate underground water lines just as the Telephone Company uses them to locate underground cables.

But telling about them and their values and uses is another story.

• • •

Garbage Grinders and Sewage Treatment at a State Hospital

WITHIN the past year, garbage grinders have been installed at the Elgin, Ill., State Hospital. By last September, at least 75 percent of all garbage was being ground and discharged into the institution's sewers. The results of this method of disposal were summarized by Thomas Cooper, Jr., sanitary engineer, in a recent issue of the Digester, publication of the Illinois State Sanitary Engineering Division.

In general, the grinder installations have increased the total biological load on the treatment plant from 45 to 55 percent, and this increased load has been a definite aid in overall treatment. The plant is of the activated sludge type. Data reported include: Flow 0.585 mgd. from a population of 8000; detention in primary tanks 2.8 hrs., in aeration tanks 12.2 hrs. and in final tanks 3.2 hrs.; digester capacity 5.4 cu. ft. per person; gas production average 17,970 cu. ft. per day or 2.3 cu. ft. per person; reduction of BOD in the primary 38.9 percent and of SS 60.2 percent. Total BOD reduction through the plant is 96.6 percent.

The principal disadvantage from the addition of the garbage appears to be the tremendous "biologic" increase on top of what was already the peak flow. This makes for a vast difference between night and day flow. For good operation, it is necessary to check the solids in the mixed liquor much more often than previously.

Raw sludge characteristics for the period before, during and after installation of the grinders are of interest. In 1952, with little or no grinder installation, average gallons of raw sludge pumped was 5,830, as compared to 9,200 gallons during early 1953 with about half the garbage being ground, and to 9,250 gallons with about 75 percent of the garbage discharged after grinding to the plant sewers. Sewage flow did not increase. Volatile solids increased from 948 pounds to 1450 pounds to 1550 pounds for the three periods; and gas production from 11,300 to 16,100 to 17,970 cu. ft./day.

BOD of the raw sewage increased from an average of 269 ppm in 1952 to 286 ppm in mid-1953, with grinder installation about 50 percent complete, to 360 ppm in the fall of 1953. During the same period suspended solids have increased from 224 ppm to only 241 ppm. The efficiency of removal of both BOD and SS in the primary clarifier has increased. BOD removal in 1952 in the primary clarifier was 37.6 percent; in mid-1953 it was 32.4 percent; and last fall, with grinding about 75 percent complete, it was 38.9 percent. Suspended solids removal, during the same periods, was 48.4 percent, 54.2 percent and 60.2 percent.

●TENNANT Sweeper cleans 48" path; replaces 3 to 12-man crew.

New Compact Machine Sweeps Gutters Walks and Alleys at 1/5 Usual Cost

BY SWEEPING congested areas with a new type power sweeper instead of pushbrooms, Akron, Cleveland and several other cities may save up to 80% this year in labor costs.

The new sweeper, shown at the APWA meeting in New Orleans last fall, is a compact heavy-duty machine. It cleans a 48" path and turns easily in a 5-ft. radius.

Its sweeping capacity is reported to equal that of a 3 to 12-man pushbroom crew.

Sweeps Cleaner Than a Crew

The sweeper has a powerful brush-and-vacuum system which eliminates need for water spraying or "wetting down." A rotating curb-brush sweeps leaves, dust and litter into main path of the machine.

A 36" brush, in a vacuumized compartment, throws dirt forward into an enclosed 9 cu. ft. hopper. Sweeping speed, with 2-speed transmission, is 1½ to 8 MPH.

Pays For Itself In 6 Months

The new sweeper has proved most successful in "mechanizing" whitewing work in special congested areas where big sweepers can't be used—such as gutters in downtown areas, walks, alleys, garages, driveways, etc.

In such areas a single machine is said to pay for itself in 1 to 6 months.

Air terminals, auditoriums, piers and parking lots also can be swept most economically this way.

For details, please write or wire to the G. H. TENNANT CO., 2578 N. 2nd St., Minneapolis 11, Minnesota.

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Easily adjusted to spread uniform thicknesses over varying contours. Wheelbase is 22'10". The BURCH Paver is tractor-pulled; but its operation is hydraulically controlled, with power supplied by a self-contained gasoline engine. Entire frame can be lifted to a clearance of 10 inches between blades and ground for easy transportation.

Material is rolled and mixed FOUR times. Dividing blade is hydraulically controlled to distribute material to right or left for desired distribution.

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Lighting and Traffic Control

Quick Change to Mercury Vapor Lighting

CHANGING to mercury vapor street lighting in Seattle was quick and easy. It was necessary only to remove the old fixtures, using the old base and lower pole sections and adding 15-ft. pole extensions and special brackets. This procedure saved time and money. Use of the old bases and sections eliminated the necessity for rewiring traffic control, fire alarm and communications systems mounted on the poles. A simple rewiring of the lighting circuit was all that was necessary. The new mercury vapor lights were in operation on the evening of the day they were installed.

The extension details were specially designed by the Engineering Department of the City of Seattle, Wash., and were fabricated by the Pacific Car and Foundry Co., manufacturers of steel light poles. Installation details were simple: The old fixtures were removed, the pole extension slipped over the existing lower pole section and the old and new sections joined with a special grouting material. Poles were 12-sided, fluted, with cast steel cap and bracket holder. Brackets were 6 ft. long. The height of the old luminaire above the pavement was 21 ft. 11 ins., of the new luminaire 30 ft. Luminaires are GE Form 109, with EH-1, 400-watt, 20,000 lumen lamps. A total of 1264 conversions are being made along 23 streets of the business area. Donald Close Co., Seattle, is contractor. The work began last August and was completed early this spring. Readings on installations completed to February 16 averaged 2.5 ft.-candles.

● **PEDESTRIAN'S view of completed conversion, showing pole extension, new bracket, mercury vapor light and ballast at top of pole. Pipe arm is used to insert special permanent grouting compound in joint of shafts. This will be removed later and the hole plugged.**

Cold Cathode Lights Chosen for Their Ease of Maintenance

The first section of a cold cathode fluorescent lighting installation was switched on for the first time at the beginning of September at the Pier Head, Liverpool. Believed to be the first street-lighting installation in the world to employ vertical cold cathode fluorescent lanterns, the scheme marks the beginning of a new phase in exterior decorative illumination.

The decision to install cold cathode equipment was largely influenced by the maintenance factor, for in the Pier Head area high winds may be encountered even under relatively calm weather conditions. Inclement weather makes work on street-lighting units virtually impossible. Cold cathode lanterns combine nearly all the characteristics required for easy maintenance, it is claimed. They have no complicated starter equipment and operate efficiently even under fluctuating voltage conditions. The use of Osram cold cathode fluorescent tubes, which have an average tube life of 15,000 hr., makes possible the construction of a street-lighting lantern without doors and hinges, which can be sealed for long periods without attention. It is said that it is unlikely that it will be necessary to open the units at all for 3½ years. Maintenance will be carried out by removing the complete lantern to the Lighting Department workshops.—From The Contract Journal, via Highway Research Abstracts.

Your choice of street name signs
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Now's the time to mail this month's Reader's Service card.

Sacramento Water and Sewer Maintenance

(*Continued from page* 87)

expect a tap crew. An important feature of this system is that it is impersonal. Handing out crew assignments is done in precisely the same way by whoever is on the desk, and no deviation is permitted except for the most unusual circumstances.

For repair work on water lines there is another system worth mention. It took about a year for the city engineer's office to make a big city map showing every gate valve with its number. This large map was then cut into sections and blueprinted on sheets about 11 x 14 inches, which are mounted in a heavy-duty post binder. There is a thoroughly good index. After each map page there is a page or two giving full information about each gate; its precise location with reference to intersection corners and curbs, its size, type, and depth.

When a break occurs the crew foreman finds the map section in his book, and he can determine at a glance what gates in the vicinity must be shut off to enable his men to begin work. While they are getting their tools out he can refer to the accompanying pages of descriptions and tell each man exactly where the gate is to be found, and what he will need to shut it off. At times as many as 5 gates must be shut off before a break is isolated.

The leaf load in Sacramento is very heavy. This is one of the cities which take pride in shaded streets. The average citizen doesn't know how much extra work this may require. If the fall rainy season begins with a general fall of leaves a city-wide clogging of gutter drains and intakes can be expected. At such times the flexibility of the distribution organization shows up in a hurry. A big city map has been mounted on thin hardboard, and then jig-sawed into sections which are of different sizes and shapes according to the load experienced in previous years.

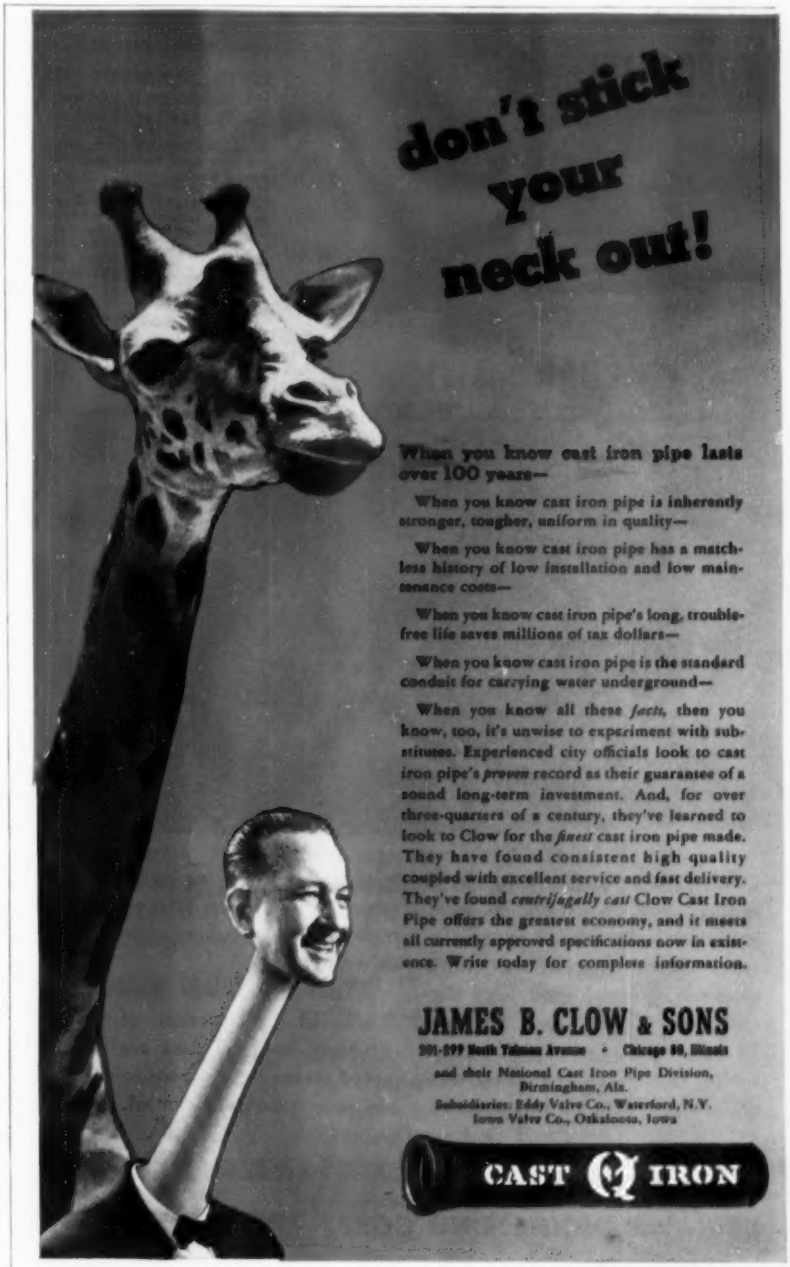
Each crew is given one of these map sections, which shows intakes and street drainage, and each crew sticks to the section assigned to it. In this way the entire city is covered systematically in a short time.

The plugs are serviced by one man who works over the entire system, again and again. He oils and greases each plug, makes minor repairs, and renews the paint. He must see that each plug-head has the right paint color. A green head means that the plug flows 1000 GPM, a yellow head means 750 GPM, and a red head means 500 GPM. These colors help the fire department to tell at once what plugs to choose for its needs.

Lantern filling is usually a messy business. Here it has been simplified by installing a 450-gallon tank outside the shop building. Kerosene is piped into the building to three small upright tanks mounted over a steel tray which drains back to an outside tank. All lanterns can be filled in a jiffy by setting them under the three small tanks and opening the cocks in the outlet tubing. Not over two hours is ever needed for the job.

All ditching is contracted, and some major main laying is let out. Some work which might be contracted is done by the city, for good reasons, with no complaint from contractors, and the crews work on jobs which may be close together. The city backfills all ditches, and the street department paves all cuts.

The extensions of mains and dwelling service results mostly from annexation of suburbs. In some


don't stick your neck out!
When you know cast iron pipe lasts over 100 years—
When you know cast iron pipe is inherently stronger, tougher, uniform in quality—
When you know cast iron pipe has a matchless history of low installation and low maintenance costs—
When you know cast iron pipe's long, trouble-free life saves millions of tax dollars—
When you know cast iron pipe is the standard conduit for carrying water underground—
When you know all these facts, then you know, too, it's unwise to experiment with substitutes. Experienced city officials look to cast iron pipe's proven record as their guarantee of a sound long-term investment. And, for over three-quarters of a century, they've learned to look to Clow for the finest cast iron pipe made. They have found consistent high quality coupled with excellent service and fast delivery. They've found centrifugally cast Clow Cast Iron Pipe offers the greatest economy, and it meets all currently approved specifications now in existence. Write today for complete information.
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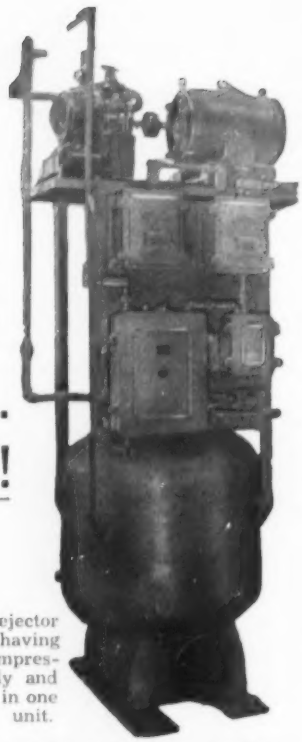

Compact ejector system having motor compressor assembly and all controls in one "packaged" unit.

PREFERRED by most prominent consulting engineers as **LESS MESSY, MORE SANITARY** than centrifugal submerged type sewage ejectors or pumps.

ENDS CLEANING of screens and pumps.

LIFTS STRAIGHT UP, 150 feet capacity, once a minute, without fail.

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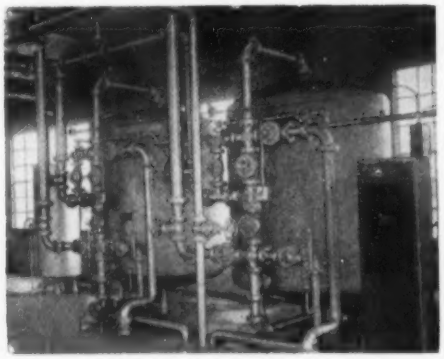

Lakeside uses different kinds of zeolites and accessories to meet your particular needs in a softener. Such care insures high capacity, minimal cost, long life and ease of operation. Bulletin 78 tells you a great deal about zeolite softening, including the capacities of the various zeolites, how to determine the amount of zeolite required and how to compute the dimensions for any softening unit.

Sectional drawings show the details of construction of the softeners, and full data are presented on manual, semi-automatic and fully automatic control.

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LAKESIDE ENGINEERING CORP. 222 West Adams Street Chicago 6, Ill.

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cases this added responsibility taken over by the city causes no great difficulty. Planning has to take in more territory, which is normal. In other cases, where the building of subdivisions has been done with inferior underground installations, as when mains of temporary-type materials are used, the annexation may mean considerable expense for the future if not for the immediate present.

Over the past 10 years 100 new taps have been installed per month for sewers or water. Water is used freely throughout the city, with no restrictions. The rates are low, $1.05 per month for a 5-room house, and $1.40 for 6 rooms.

The following block of figures from the Annual Report of the city for 1952 helps to present the saving from this joint administration:

Divisions: Administration, total cost $64,653 and cost per million gallons $5.11; Commercial, total cost $31,615 and cost per million gallons $2.50; Pumping, total cost $124,746 and cost per million gallons $9.87; Purification, total cost $109,662 and cost per million gallons $8.68; and Distribution and Maintenance, total cost $106,616, with a cost of $8.44 per million gallons. This gives a total cost of $427,294 and a cost per million gallons of $34.60.

• • •

Civil Defense

(*Continued from page* 72)

will find operational maps on which years of accumulated taxonomic and epidemiological data have been plotted, and a cache of emergency chemicals. They will work under the direction of key health department vector control personnel who have been trained for the purpose.

Our entire vector control organization is dependent upon three factors: (1) Adaptability— the ability to meet changing or extreme conditions; (2) training of key personnel, and operational data based on normal routines and scientific research over the past several years; and (3) most efficient methods possible in use of powered or manual equipment, and in the adoption and use of chemicals for disaster purposes.

Most of our normal vector control work has been built on a foundation of public demand for control of mosquitoes. For that reason much of our research has been directed toward finding the most effective methods of mosquito larvaciding. We have tried many formulations and have come to the conclusion

that an emulsion concentrate containing 24 percent methoxychlor, 63 percent methylated napthalene, 10 percent dimethyl phthalate and 3 percent emulsifier gives excellent results in mosquito larvaciding. This is a commercial formulation and is available usually in quantity and on short notice. We use this concentrate at the rate of one pint made up to five gallons with water in a knapsack sprayer as a rule. This gives, under field conditions, an apparent 100 percent kill of larvae and pupae within twelve hours. This is a most effective application.

To achieve this result it is necessary to spray uniformly around the margins of water holes and creeks at the rate of about 10 gallons of spray to the surface acre of water in creek or waterhole. This concentration has had no detrimental effect on fish populations so far, but most of the fish observed were minnows of the family *Cyprinidae*, and small catfish. The formulation is especially valuable when there is debris or matted algae on the surface of the water or when there is rooted vegetation in the marginal water. Further, it will kill anopheline and culicine larval and pupal stages with about equal facility. The principal reason that this chemical formulation is valuable to us in disaster planning, however, is because we have had very good experimental results in killing houseflies with it also. Thus it is a good insecticide for variable conditions. Two gallons of the concentrate made up to 50 gallons with water and sprayed with a fine nozzle setting and a nozzle pressure of about 125 lbs. has given us a very excellent knockdown and contact kill of houseflies. Our data on residual effect of the insecticide is incomplete with regard to mosquito breeding, but the residual effect when used on walls for flies seems to be comparable to that of DDT.

We have also found that we get a good kill with this formulation among some populations of flies that are known to be resistant to DDT. The methoxychlor concentrate has some limitations however. For instance, we find that in fogging for adult mosquitoes or houseflies with exhaust manifold thermal generators we have to step up the concentration to about 7 to 8 percent methoxychlor by weight to obtain results comparable with use of 0.5 percent Lindane. There are also occasions where fogging or spraying for adult flies is undesirable for one reason or another, and we find that malathion, an organic phosphorus compound, is useful as a bait appli-

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cation and under disaster conditions could be used occasionally as a contact insecticide also.

Rodent Control

Inasfar as the rodent problem is concerned, we anticipate that under disaster conditions some mass poisoning of rats may become essential. Standard procedures and chemicals would be used in that eventuality—anti-coagulants, cyanogas, etc. It is certain that we would have to do some large scale treating of rat-infested areas for fleas. This would have to be done before any mass poisoning of rats because of the migratory habits of the rat flea. In this region, 10 percent technical DDT dust is still effective in flea control. We also find DDT dust very good for most varieties of sucking lice—and the human infecting species could become a problem under disaster conditions. For ticks and mites, we have found 3 percent gamma BHC dust very effective where it can be applied, and a very small percentage of Lindane emulsifiable concentrate in water has proven effective when sprayed on infestations of these arthropods.

Wide World Photo

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English Experiments with Fog Lamps

Reports from the Road Research Laboratory in England indicate that the seeing distance in fog at night depends on the mounting height of the lamp and the shape and intensity of the beam. In general, the available light should be employed in illuminating the full width of the road near the vehicle. Yellow beams appear to have no advantage over white beams.

Plastic Pipe for Outdoor Ice Skating Rink

Polyethylene plastic pipe was used in the construction of a "take-up" or temporary ice skating rink in Detroit, Mich. The ground area covered was about 70 by 140 ft. and the plastic pipe permitted quick placement of the pipe necessary to carry the freezing solution. In the spring, the pipe will be taken up and stored for future use.

Saving Money by Weed Control

Ohio's Highway Department saved $12.98 per mile on primary roads and $8.16 per mile on secondary roads by the use of weed control chemicals in connection with mowing according to W. J. Garmhausen, Chief Landscape Architect. Both 2,4-D and a mixture of 2,4-D and 2,4,S-T were used. By eliminating weeds the amount of necessary mowing was reduced, thus the saving.

• • •

Enzymes Give Good Results in Sewage Treatment Plant

"Reference your editorial in the January issue concerning the uses of enzymes, we seem to be in agreement on this subject. The enclosed data may start some thinking and encourage someone else to try."—Roy R. Robinson, City Superintendent, Charlevoix, Mich.

THE Niles, Mich., sewage treatment plant receives the flow from a combined storm-sanitary sewer system serving a population of about 14,000. Sand and chloride are used for ice control in the winter; and some of the streets are unpaved. Consequently considerable inert material reaches the sewage treatment plant; in addition there are some industrial wastes from wire cleaning and carbide using plants.

After about three years of operation difficulty was experienced in 1952 in pumping sludge from the

settling tanks and the digesters, especially the south digester which was used mainly for winter storage of sludge. The following summer a settling tank was dewatered and a bad coning condition found in the hopper. Further investigation revealed the same condition in the digester. The settling tanks were dewatered and cleaned and the digester cleaned and flushed by means of fire hose, scrapers and a lot of wear and tear on the operators, as the accumulation had a rubbery consistency and was very difficult to handle.

TABLE 2—SLUDGE DRAWN

Date	Drawoff	Solids
1953	*Gallons*	*Percent*
Jan. 1	14,000	9.1
June 22	20,600	13.8
July 1	17,000	14.5
July 10	13,200	13.8
July 17	16,500	16.8

After reading about Enzymatic and corresponding with the manufacturer, it was decided to experiment with one 100-lb. drum which, at the time, sold for $325. We started March 1 by feeding the Enzymatic to the settling tanks at the rate of 1½ pounds per mg.

TABLE 1—GENERAL DATA, VOLATILE SOLIDS AND GAS

Month	Flow	Susp. Solids	Volatile Solids to Digester	Gas Production
1953	*MGD*	*PPM*	*pounds/day*	*cubic feet*
February	1.18	203	875	290,644
March	1.28	242	720	480,417
April	2.00	328	1210	324,249
May	2.28	438	910	449,518
June	2.00	514	955	401,148

Note: Digester temperature was maintained between 89 and 95°F.

The above data were supplied by Mr. Robinson. The report below, from the log of Charles Clem, Superintendent, indicates that the effort was very much worth while and we are informed that it is proposed to use an enzyme again this year. Until last August, Mr. Robinson was Manager of the Board of Public Works of Niles.

Though while adding Enzymatic in March, there was an average of 155 pounds less of volatile solids per day than in February, gas production rose from 290,644 cu. ft. to 480,417 cu. ft. In addition to the increased gas production, the added enzyme improved digestion so that supernatant solids were maintained at a safe level and we were able to store sludge in the digester. This was fortunate for all sludge drying beds were filled. The increased gas production was enough for all heating and allowed starting the gas engine for pumping sewage two months earlier than usual. We saved $95 on fuel oil plus the saving in electricity for pumping. It looks as though we can draw all the sludge we want from the digesters as soon as the sludge beds are empty and the cost of the Enzymatic is well worth while from that standpoint alone.

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. . . the utilization of a Royer Sludge Disintegrator. And it is an easy operation; no expensive installation costs are involved; no specially trained labor is needed for its operation.

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PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

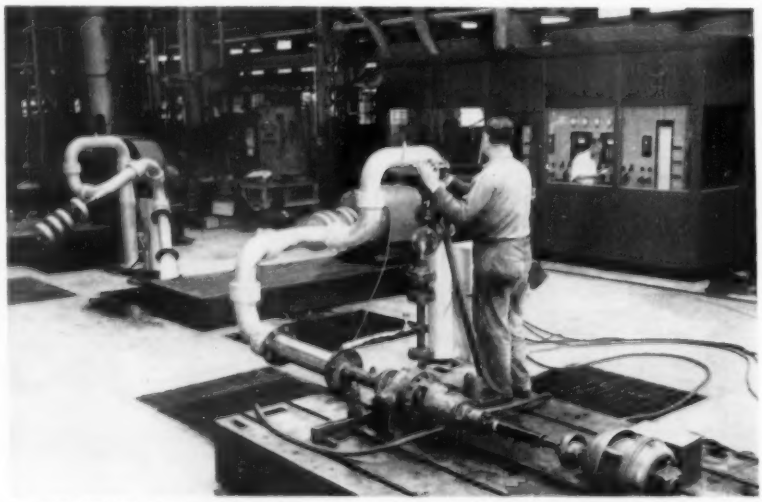
Harvesting Underwater Weeds

Many lakes develop heavy algae and weed growth conditions which detract from their aesthetic and recreational values and make their waters difficult to purify. This is due to fertilization by washings from fertilized fields, sewage, and other causes which it would be difficult to eliminate. A study of the problem has been made by the University of Wisconsin, one of the outcomes of which is a proposal to remove periodically the tops of the bottom-growing weeds, which not only are themselves objectionable, but also collect floating algae, dead fish and other debris. It was proposed to remove only the tops of these weeds, not eliminate them, and a machine was devised, mounted on a barge, which cut a swath 8 ft. wide and down to 5 ft. deep as the barge was propelled through the water at a rate of 2 mph. The weeds are cut by a reciprocating-type mower bar and the cuttings removed by an endless belt 8 ft. wide, which deposits them on the deck of the barge. They are then deposited on shore for final disposal. They are fairly high in nutrients and vitamins and it is possible they might be sold for use as stock feed or a soil additive. The cost of such a harvesting outfit would be in the range of $20,000, and the annual operating cost $10,000 to $15,000.

"Harvesting Underwater Weeds." By Donald F. Livermore, Asst. Prof. of Mechanical Eng. *Water Works Engineering*, February.

Combined Airstrip And Catchment Area

St. Thomas, Virgin Islands, has no natural groundwater, the only supply being obtained from catchment areas paved with tile or concrete, the average yield of which is about 8 gal. per sq. ft. per annum. Our forces on the island needed an additional supply. If ordinary catchment areas were used, an enemy might gauge the size of the garrison by the combined area of these. An extraordinary catchment area was obtained by utilizing an airstrip 4200 ft. long and 200 ft. wide. This was given a cross slope of 1:100 to one side, where the runoff was collected and piped to a 1.5 mg under-



● PORTION of Worthington's test floor. Room in background houses instruments.

Testing Pumps with Capacities to 100,000 GPM

ONE of the world's largest, most complete and flexible hydraulic test laboratories has been put into service by Worthington Corporation, Harrison, N. J. Covering an area of more than 20,000 sq. ft., the laboratory has been over three years in planning and building. It supplements the standard test area of the corporation, which can handle pumps not exceeding 2000 gpm or 600 hp. The new laboratory is capable of duplicating hydraulic field conditions for more than 10,000 different types and sizes of pumps currently being produced, and it can test pumps up to 100,000 gpm capacity.

For test purposes, two parallel underfloor water channels are provided; the larger is 12 ft. wide and 15 to 24 ft. deep; the other is 10 ft. deep and 8 ft. wide. Electric power supply is available at 4150 volts up to 3600 hp; also in 2400, 440 and 220 volts ac and various dc voltages. Steam lines for turbine drives are available at 250 psi and 700 psi. Venturi tubes measure the flow of water and other instruments give accurate recordings of power requirements, pump operation and efficiency. Pumps on test are driven by calibrated induction motors through universal shaft extensions, and 25 different size motors are available for testing, covering a very wide range of pump size and capacity.

This hydraulic laboratory was previewed to a group of editors of technical publications in early February. It was an impressive demonstration of modern and complete testing equipment designed for both daily use and research.

ground storage tank; then filtered, chlorinated and pumped into a gallery well, which recharges the groundwater supply, which floats to a depth of 40 to 80 ft. on the sea water table.

"Airdrome Is Water Supply Reservoir." By M. D. Morris, *PUBLIC WORKS*, March.

Underground Movement of Pollutants

From studies on soils continuously spread with settled sewage or sewage plant effluents, the Univ. of Calif. Research Labs. concluded that: There are two aspects of travel of pollution underground — movement with percolating water above the groundwater table, and movement with ground water. The former is vertical. It is reported (but not confirmed) that bacteria will travel little more than 5 ft. in moist or dry fine soils. Where the ground water table is near the surface of a spreading basin, it must be presumed that coliform bacteria will enter the ground water through porous soil, root channels, or rodent holes. Where the soil is a fine sandy loam, a bacteriologically safe water can be produced by percolating sewage plant effluent through at least 4 ft. of soil; the removal is less for porous soils; rate of application seems to have no correlation. Most of the bacteria removed remain at the surface of the ground and are not washed down by later applications of water.

The chemical nature of percolating sewage is little altered by passage through as much as 13 ft. of the soil referred to after the initial ion-exchange equilibrium has been satisfied, except the change effected by bacterial action. Chemicals reaching the ground water will generally be unchanged except by dilution. They travel farther and faster than do bacterial pollutants in the ground water; sometimes several miles.

"Underground Movement of Bacterial and Chemical Pollutants." By R. G. Butler, G. T. Orlob, and P. H. McGaughey, Univ. of Calif. *Journal, American Water Works Ass'n*, February.

Water Spreading In San Gabriel Valley

This article is based on more than 35 years' experience with water spreading. Techniques have been devised for concentrating on areas overlying pervious sands and gravels, resulting in at least an 80% beneficial use of the property set aside for water conservation. The

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capital investment and operating cost for spreading grounds 150 acres and larger would not exceed $8.00 per acre-foot of flood waters conserved; or $3.00-$4.00 if the development costs of the grounds are assigned to the initial purpose of conservation of floodwaters. The article discusses an example of a large ground water basin where the considerable overdraft creates such a severe lowering of the water table as to permit replenishment largely by means of storage of imported water in the basin through spreading.

"Water Spreading Operations in the San Gabriel Valley." By Finley B. Laverty, Chf. Hydraulic Engr. *Journal, American Water Works Ass'n*, February.

Sand in Water Systems

Sand frequently is found in water obtained from wells. It abrades pumps, chlorinators, injectors and valves; consumers' fixtures; control mechanism in treatment plants, and meters. When the water supply is obtained from several wells it is desirable to learn which well or wells are the worst offenders, as a preliminary to devising preventive measures. If sand traps are to be used, the amount of sand carried by the water should be known. The author describes devices and methods for collecting samples and determining the sand concentration; and estimating the rate at which sand would be caught by a sand trap.

The accumulation of sand in mains is discussed, and methods for preventing and for removing it. He finds that consumer complaints of sandy water vary inversely as the square of the diameter of the mains serving them. Flushing for removing sand is effective only when the velocity of the flushing water is at least 5 fps. Consumer troubles may be relieved by putting the house connection tap on top of the main, if it is a large main; or by feeding the small mains vertically from the top of the large ones. Where sand concentration in the water supply is less than 0.10 cu. ft. per million gallons, no sand troubles have been found, but where it exceeds 0.3 cu. ft., complaints of sanded meters invariably result.

"Control of Sand in Water Systems." By John R. Rossum, Engr. California Water Services Co. *Journal, American Water Works Ass'n*, February.

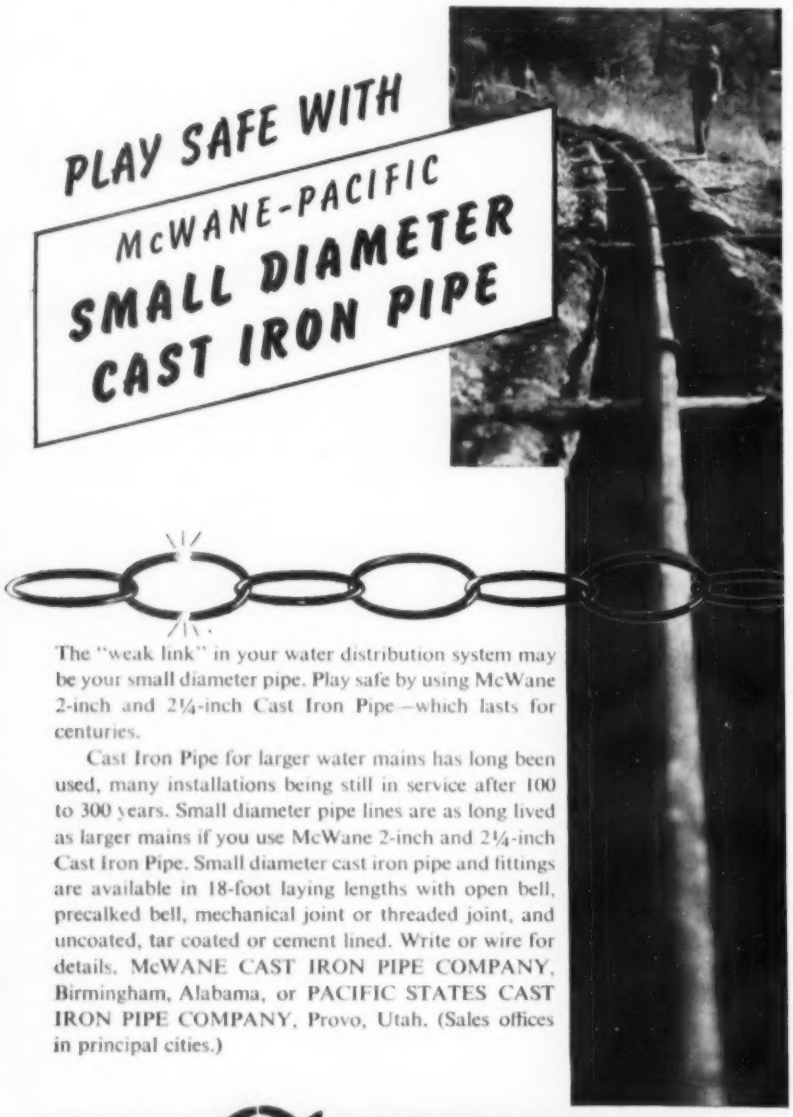
Selecting Vertical Turbine Pumps

It is poor economy to select the size of turbine pump sufficient for only the present head conditions and desired capacity. If the local water table falls or the water demand increases, both of which are probable, this can be met by adding additional stages to the bowl assembly. But this involves additional driver power and possibly heavier line shafting; the cost of which would greatly exceed the additional cost of originally providing a pump adequate for changing conditions for a reasonable future.

"Ground Water Changes Affect Selection of Turbine Pumps." By Charles R. Stempf, Worthington Corp. *Water Works Engineering*, February.

Measuring Wash Water

Water for backwashing filters is ordinarily supplied either by overhead tanks or by centrifugal pumps. The latter occupy little space and are generally cheaper, produce a constant head, and can be used for measuring the wash water rate. A Venturi meter, often used for such measuring, with the length of



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straight pipe necessary, would require a length of 16 ft. or more. The author describes a method of using the pump for measuring the rate of wash water. A differential gauge is used to indicate the net head, graduated in inches of wash water use, calculated for the particular pump and area of filter in question. The differential gauge must be sensitive and nearly frictionless. The arrangement described gives a very simple, inexpensive and sufficiently accurate method for measuring the rates of back-wash water, reliable so long as the pump is kept in good condition.

"Wash Water Measurement in Filtration Practice." By Robert W. Angus. *Water & Sewage Works*, February.

Pipe Corrosion And Water Velocity

The velocity of water in a pipe must be below 2 ft. per second for the usual type of mound-shaped tubercle to form. Up to 4 ft. per second there is a transition from mound-shaped to cone-shaped tubercles, and the number of them decreases. If the velocity is up to 10 fps, the tubercles would be still smaller—probably not more than 1/20 the size of those in pipes with low velocity. Corrosiveness of the water increases the size and number of tubercles but the effect of velocity is the same.

Measurement of friction loss in a long section of pipe may give little information on the corrosive tendency of the water, since the velocity of flow in that pipe affects the formation of tubercles. If the flow varies widely, the rate of tuberculation would probably be that due to the low velocity, unless the fluctuation has occurred daily.

"Water Velocity and Corrosion." By John R. Baylis, Engr. of Water Purif., Chicago. *Pure Water*, January.

Diatomaceous Earth Filtration

There are four diatomaceous-earth filter installations in use on public water supplies in New York State. The author describes the installation and operation of that at Tupper Lake—capacity 1.75 mgd, one of the largest municipal plants in the country. Most of the diatomaceous earth used in such filters is mined in California and the cost of transportation brings the price to 6-7 cents a pound, which makes this filter an expensive one in the East. These filters treat relatively clear waters without prior coagula-

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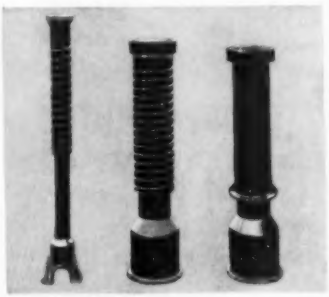

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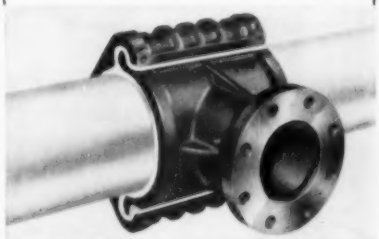

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tion and sedimentation. Turbidities below 20-30 ppm can be removed economically without pretreatment. These filters will not remove more than 40-50% of color. Their most fruitful field is the removal of algae and amorphous matter from otherwise relatively clear waters of low color. The loss of head through diatomaceous-earth filters considerably exceeds that through conventional sand filters; 35 psi is found to be economical, when it exceeds this the filter should be cleaned.

By J. Kenneth Fraser, Cons. Engr., and C. R. Cox and C. S. Maneri, N.Y. State Dept. of Health. *Journal, American Water Works Ass'n*, February.

Hydrogen Sulfide In Florida Well Water

Artesian well water from Florida's major water supply aquifer, the Ocala formation, contains 1.0 to 4.0 ppm of dissolved sulfides as H_2S. This gives the water highly objectionable taste and odor, corrodes iron, steel, copper and galvanized pipes. Methods in common use for removing the gas from public supplies include: aerators in elevated tanks; atmospheric aerators using either natural or forced-draft ventilation in conjunction with ground storage reservoirs, the aerators being generally of the slat tray type, with or without coke, crushed stone, etc.; aeration with compressed air in hydropneumatic tanks; chlorination to oxidize the sulfides to free sulfur or sulfuric acid. The first of these is effective if detention in the tank is 2½ to 3 hr. Atmospheric aerators reduce dissolved sulfides by 35-45%, and complete removal is obtained with these and 1-2 hr. detention in ground storage reservoirs, especially if secondary chlorination is provided.

"Hydrogen Sulfide Problems of Small Water Systems." By Sidney W. Wells, Chemist, State Bd. of Health. *Journal American Water Works Ass'n*, February.

Economy Due To Better Mixing

At the Jamestown, N. D. water plant, the raw water is aerated and passed through a mixing chamber 18 x 36 ft. by 12 ft. deep, in the center of which are four flash tube mixers. The water formerly entered at the N W corner of the chamber and left through ports all along the east side, taking a more or less short circuit. Last year a baffle wall was built down the center, with two mixers on each side, compelling the water to pass south past two mixers and then north past the other two. This so improved the mixing of the milk of lime and sodium aluminate that the dosage of lime was reduced from 3187 lb. per mg to 2623, and 46 lb. of aluminate to 23, and the washwater was reduced over 60%. The hardness was reduced to 122 as compared to 136 formerly.

"Baffle Control in Mixing Basin Cuts Costs at Jamestown, N.D." *Water Works Engineering*, February.

Washing Filters

If a filter is well constructed, nearly all trouble with it will be caused by improper washing. If it is not washed before the head increases to 8 or 9 ft., the material deposited on the filter will have become so compacted that it cannot be washed out without removing some of the sand, and "mud balls" will form. Preliminary surface washing is almost necessary for good washing. Automatic control of backwash rate is attractive in theory but may not be practical where a wide-open backwash valve

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would wash sand from the filter. Float-operated flow-rate and loss-of-head gauges generally require considerable attention. The author finds that a pneumatic telemetering system performs well. Valve position indicators give much trouble; flexible operating shafts are more economical than cables with counterweights. The cotton plug filter is a useful device to attach to each filter effluent. A single butterfly valve in the recovery cone of a cylindrical tube decreases the surging of the water through the filter effluent piping, particularly at high filtration rates. In replacing gravel and sand in large plants, it is cheaper to rescreen the material, if the gravel and sand have become mixed, than to purchase new; but not in small plants.

"Washing and Maintenance of Filters." By John R. Baylis, Engr. of Water Purification, Chicago. *Journal, American Water Works Ass'n*, February.

Other Articles

"Meter Overhaul Program Increased Revenue by Fourteen Percent" at Winchester, Va. PUBLIC WORKS, March.

Accuracy of Meters of three types, disc, jet and turbine, tested. "Relative Accuracy of Meter Types Investigated in Holland." By Nico J. P. Verbruggen, Amsterdam Water Works. Water Works Engineering, February.

"Pneumatic Controls and Instrumentation for Water Plants". By Russell H. Babcock, Ass't Mgr. Foxboro Co. Journal, Am. W. W. Ass'n, February.

Sedimentation of water and sewage. "The Facts and Theories of Sedimentation." By L. B. Escritt. Municipal Engineering (England), Feb. 5.

"Stationary Chlorine Storage at Tampa." By John S. Long, Supt. Journal, Am. W. W. Ass'n, January. See Digest in the March issue.

"Water Softening for Municipalities and Industries." History and description of the various processes. By Eskel Nordell, Permutit Co. PUBLIC WORKS, March.

"Construction Program of Philadelphia Suburban Water Company." By Francis S. Friel. Civil Engineering, February.

Boating on Manchester, N. H. reservoir. "Health Board Order to Prevent Recreation on Reservoir Voided." Water Works Engineering, February.

• • •

Protecting Highway Flagmen

To protect highway flagmen, the usual approach is to do all possible to make the man stand out from the backgound. Red jackets and caps and luminous belts are commonly used as safety measures.

Sparling WATER CONTROL EQUIPMENT

Accurate

Simple in Action

Easy to Install

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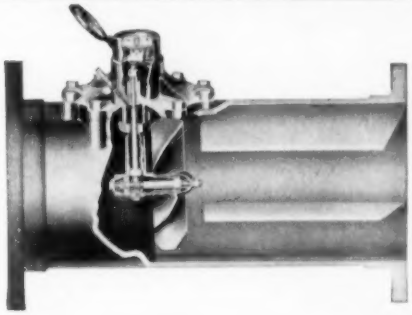

As shown, flow is from right to left; the propeller revolves in direct ratio to velocity of flow, and registers volumetrically in register on meterhead. No further instrumentation necessary for logging a main-line!

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Two-Way Radio

(Continued from page 90)

location of transmission towers, officials abandoned accepted methods and spent $8,000 to find out whether line-of-sight transmission was absolutely necessary. Using equipment borrowed from radio manufacturers, the highway department set up a pilot network of towers and transmitters throughout the state. In effect what highway officials did was to figure out the areas where transmission facilities should be located to provide the best operation at the lowest cost. Then, they looked for the highest point in each area which was near a powerline and accessible to automobiles. Here, the test equipment was installed.

As soon as the test began, it was apparent that line-of-sight transmission would not be required for the permanent system. In several instances, officials were able to talk between points located at elevations of 5,000 feet despite intervening mountains 10,000 to 12,000 feet high.

The job of obtaining equipment which would be sure to work in the rigors of winter in the Wyoming mountains involved numerous technical problems. Highway department officials solved them by making their specifications extremely rigid and then letting the bidders figure out ways of meeting them. Realizing that the lowest bid might not be the best one under the circumstances, the department reserved the right to award the contract to the manufacturer offering the best solution to the problem. As it turned out, however, the firm which received the job, Motorola, submitted the low bid for the equipment—$279,768.

Here's how police and maintenance vehicles were tied into the new system: police vehicles have receivers which operate on one frequency, 42.82 megacycles. Receivers in highway maintenance cars operate on another frequency, 47.22 megacycles. Specially - designed transmitters in each type of vehicle are capable of operating on either frequency.

When a police car, say, wants to call a highway maintenance car, the officer sends his message on the 47.22 megacycle band. The official in the maintenance car, when he replies, sends his message on the 42.82 megacycle band.

The great distances between population centers in Wyoming makes it important for sheriffs and municipal police departments to be tied into the state-wide net. Accordingly, it was decided that the state should purchase and maintain mobile equipment for local law enforcement agencies at a monthly charge of $25 per unit. The sheriff's radio circuit operates at a frequency of 42.82 megacycles, the same as the state patrol. Local police messages are handled on 161.73 megacycles. The system includes equipment which automatically transfers messages from the police frequency to those used by sheriffs, state highway and state patrol vehicles.

• • •

Fertilizer from Sewage Treatment Plant Supernatant

Since the supernatant overflow from digesters at modern sewage treatment plants contains many fertilizing elements, Tacoma, Wash., is investigating the possible uses—and sale—of this material. It is believed that it will be especially suitable for golf greens, parks and other large grassy areas.

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to SEATTLE
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A.W.W.A. Convention
May 23 to 28
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Big, wide-opening side doors, too, are standard equipment on all Gar Wood Load-Packers. Refuse too bulky or too long for even the big Load-Packer hopper can be loaded through these convenient doors. Thus selective loading is eliminated—nothing is left for householders to dispose of themselves. Complaints are reduced and service and public relations improved.

You can do a real service for your tax-payers by putting Gar Wood Load-Packers to work in your community. Join the thousands of other cities, towns and villages that depend on Gar Wood Load-Packers for fast, efficient, economical refuse collection. Get the Load-Packer story *today!*

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PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Progress on the Ohio Turnpike

After delays caused by legal and financial difficulties, the Ohio Turnpike Commission on Oct. 21 let contracts for 43 of the 62 construction sections covering 162 miles of turnpike construction and by mid-November all but 4 miles of the whole 241 miles were under construction or advertised for letting. The turnpike, extending from Pennsylvania to Indiana, is scheduled for completion Oct. 1, 1955. The toll charged will be 1¼ ct. per mile for motorists and an average of 4.7 ct. for truckers. It is estimated that there will be 29,500,000 cu. yd. of excavation, 46,900,000 cu. yd. of fill, 7,860,000 sq. yd. of pavement concrete, and 5,200,000 sq. yd. of bituminous shoulder surfacing. There will be dual 24-ft. pavements separated by a median with a minimum width of 56 ft. Transverse contraction joints will be spaced 61½ ft. apart, not sawed but with a ¼-in. impressed joint 1 in. deep, under which is a 6 x ⅛ in. vertical steel plate. The central longitudinal joint may be either a 2½ x ¼ in. sawed joint, or a 3⅜ x ⅜ impressed joint, or formed full depth with a sheer key. Both 10-ft. shoulders on the outside of each pavement and the 8-ft. inside shoulders will be surfaced with 3 in. of penetration bituminous macadam. The turnpike is laid out with a minimum sight distance of 900 ft., maximum curvature of 2½ degrees, and maximum grades of 2% ascending and 4% descending. Traffic can enter or leave the turnpike at 15 points, where there will be acceleration and deceleration lanes.

"Fast Work Planned on Ohio Turnpike." *Engineering News-Record*, Feb. 11.

Colored Route Markers

Some six years ago the Mississippi Highway Dept. adopted a system of designating certain highway routes through towns and cities by colored route markers, using a different color for each route. Nine cities have adopted the system, following a common planned color scheme; and the plan is generally approved by motorists, who find it easier to follow a given route, especially at night. It is proposed to introduce the system in all the major towns of the states. Maximum legibility, durability and "target" value at night were prime considerations in selection of colors and materials for the route markers. Reflectorized sheeting for the base and cut-out reflectorized figure meet most of the requirements. One of the most legible combinations is silver reflectorized letters on a black, non-reflectorized background. Among the more legible combinations at night are silver figures on green, red or blue background, both figures and background being reflectorized. Of these colors, blue fades most quickly and is least legible, while green retains its color best. The above combinations are used for the more important routes, the less desirable ones for minor routes.

Safety Precautions for Highway Workers

HANDLING sand, cinders or similar material for covering ice, snow or bituminous surface treatments has been a somewhat hazardous operation. In order to feed the spreader, the men ride on the covering material and work it down with shovels. Accidents have happened when a man lost his footing in the shifting sand and fell off the truck, suffering serious injury.

To prevent this, the Connecticut State Highway Department has placed diagonal partitions across the rear corners of the truck body thus furnishing a safe place to stand and work. A railing has also been placed around the corners providing still more safety.

These safety features were first installed on trucks in 1949 and since that time there have been no cases of men falling from the trucks during sanding operations.

The Finest Equipment For Efficient ICE CONTROL!...

The Improved **BAUGHMAN** *Hydraulic* **SPREAD-MOBILE**

- ONE-MAN OPERATION
- COMPLETELY CAB CONTROLLED
- SPREADS 300-3300 LBS. PER MILE

Exclusive "CENTER-SPRED" DESIGN *gives* VISIBLE SPREAD...POSITIVE TRACTION

✓ ***COMPLETE HYDRAULIC OPERATION***

Both *width* and *amount* of material spread are now controlled right from the truck cab. This is achieved by two independently operated hydraulic motors. One drives the drag chain (the speed of which controls the amount of material). The other drives the distributor (the speed of which determines the width of spread).

✓ ***NEW IMPROVED "CENTER-SPRED" PATTERN***

Located between front and back wheels on driver's side, the distributor spreads material *in front* of all four wheels. Result: perfect traction for Spread-Mobile, complete visibility and control of spread. Baffles can be added to control spread so it is predominantly to the driver's side or curb side.

✓ ***ADAPTABLE TO YEAR 'ROUND OPERATION***

The Spread-Mobile can be used for ice-control in winter; in summer for such road maintenance work as oil-blotting, shoulder maintenance, etc.

HEAVY-DUTY POWER UNIT

Including 14-hp T.F. Wisconsin Gas Engine with all controls in truck cab.

EXCLUSIVE EXHAUST HEAT PREVENTS FREEZING

Patented chamber utilizes exhaust heat; prevents load freezing, aids penetration.

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Adaptable in off-season periods to many of the functions of general dump body.

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Now's the time to mail this month's Reader's Service card.

"Mississippi's Colored Route Marking System." By Jack W. Chambliss, Ass't Traffic Control & Safety Engr. *PUBLIC WORKS*, March.

Bridge Construction By Maintenance Forces

The South Carolina highway maintenance forces achieve economy and efficiency in bridge construction by use of precast concrete slabs and salvaged steel spans. The slabs are generally of a standard size, 14 x 5 ft. and are used chiefly over small streams, four slabs and two curb sections bolted together giving a standard 22.5 ft. roadway width. But as many as twenty-three 14-ft. spans have been used for a 332-ft. bridge. High-strength concrete is used, reinforced both longitudinally and transversely. Yards for constructing slabs are so located that there is one within 75 miles of practically all bridge sites. Use of these concrete bridges eliminates an enormous amount of labor required for standard timber bridge construction, maintenance costs are much less, they are fireproof and more durable under traffic, and they can be dismantled and reassembled elsewhere.

When a steel bridge is replaced with a wider and modern one, it is dismantled and reassembled elsewhere, generally on secondary roads to replace narrower timber ones or when long spans are required. The bridge members are removed in as large sections as possible, burning or cutting off the heads of the fewest possible rivets, which are replaced with steel bolts in reassembling. The cost of dismantling and reassembling a steel truss bridge is about the same per lineal foot as that of constructing a new timber bridge. In two cases it was possible to float an entire steel bridge by barge from its original site to a new one.

"Pre-Cast Concrete and Salvaged Steel Bridges Save Money." By C. E. Wright. *PUBLIC WORKS*, March.

Delayed Sawing Of Control Joints

An 800 x 4,000-ft. apron is nearing completion at an air force base at Tucson, Ariz., using concrete 15 in. thick laid in 25-ft. lanes, without distributed reinforcement. Full-depth internal vibration permitted the use of a relatively dry mix which could be finished immediately. In contrast with a common procedure of cutting control joints as early as possible and intervening joints later, all joints were at first, during summer, cut at from 7 to 9 hours; but the time was gradually extended to 14 hours by October, and 26 hr. by November. The engineers have found that in pavements 12 in. or more thick it is much easier to control shrinkage cracks than in thin slabs. The joints were cut with a Jointmaster unit which rides the forms and carries four 12 in. saws mounted on a single traveling frame, which thus makes a 25 ft. cut with 6¼ ft. of travel. The cost of sawing was at first 8.6 ct. per inch-depth per foot of joint, but was reduced to 6.4 ct. with experience. The average life of a blade is 468 ft. Joints are immediately filled with fine dry dust, mounded, to prevent edge breaks by tires.

"Joints Sawed in Pouring Sequence for Concrete Apron." *Roads and Streets*, January.

Raising Low Spots On the Jersey Turnpike

The New Jersey Turnpike crosses some of the worst terrain to be found anywhere—tidal flats of deep mud. Every effort was made to con-

mow 'em down...
COSTS, that is...
investigate the *Anderson*
HYDRAULIC MOWER

Simple, convenient controls give instant, positive action. Smooth, vibrationless operation eliminates fatigue and costly maintenance. Parallel lift allows adjustment of cutting heights with single adjustment. Hydraulic lift of cutter bar to clear obstructions, reversible motor, easy knife change — all add up to less lost time, more mowing per day. Anderson Flow Control Valve gives constant and adjustable motor speed, eliminates overspeed. Your tractor dealer has performance records proving lower cost per mile. So many factors — longer life, reduced cost per mile, ease and safety of operating — that you should get complete specifications and performance records at once.

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struct an embankment that would not settle, but it was realized that some settlement was inevitable. In a number of places settlement of 2 to 4 in. has occurred in sections of the bituminous surface a few hundred feet long. These low spots have been raised, with new bituminous concrete, given a texture matching that of the existing pavement. This necessitated removing some of the existing pavement where the new surface met the old. Instead of cutting it out, a heater-planer was used to remove it. This had several advantages; the material removed had a temperature of approximately 350° and was readily workable while still warm and was used for patching on shoulders and elsewhere. There was no sharp drop at the edge of the removed pavement and rush-hour traffic could pass over it without hazard. Also by this method less inconvenience was caused to traffic which reached a peak of 80,000 vehicles traveling at 60 mph. Two Clarkmoore heater-planers were used. They have a 6 x 6 ft. steel heating hood which encloses an oil burner, and two serrated cutting blades set at an angle which windrow the softened material between the two rear wheels. The new asphaltic concrete was placed in two or more layers and thoroughly rolled.

"Smoother Riding for the New Jersey Turnpike." *PUBLIC WORKS*, March.

Blending Pit Gravel for Aggregates

Most of the glacial deposits in Minnesota consist of sand and gravel laid down in definite strata. By mixing the various grades found in the different strata in the proper proportions, the gradation specified for a given job can be obtained with a minimum of crushing and screening. One contractor supplied 40,000 tons of well-graded aggregate for a job from a pit, blending the material while it was being removed from the pit by bulldozers. Heavy bulldozers began excavating each load at the bottom of the pit and, in coming out, passed up through several strata; thus each load brought out contained material from several strata, and the operator, by using judgment, and changing to another trench when desirable, could produce a well blended material. Further blending was effected by dozing the crushed output up a long incline to the top of a stockpile containing about 2 tons of material.

"Pit Material Blended with Dozers." *Roads and Streets*, January.

NEW *McConnaughay*
MULTI-PUG ASPHALT MIXER

REMOVES BOTH MOISTURE AND SOLVENTS

MODEL HTD-500

Prepares Hot or Cold Bituminous Mixtures — ¼ Ton Capacity

Designed for economy of operation in the production of bituminous paving mixtures, this new McConnaughay HTD-500 Mixer is large enough (¼ ton capacity) for many resurfacing jobs as well as all types of pavement patching. Working on location, it provides the exact amount of material needed; never too much or too little. It has a low pressure burner directed into the mixing and heating unit through a combustion chamber. This HTD-500 and all McConnaughay HTD models are *the only mixers which effectively remove both moisture and solvents from bituminous mixtures* . . . giving you positive assurance that patches and resurfaced areas will set up hard as soon as the applied mixture cools. Write, wire or 'phone for details and specifications today.

McConnaughay HTD-500 at work on street patching job in Cheyenne, Wyoming.

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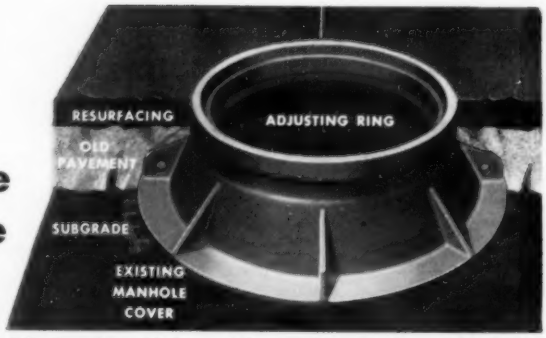
LAFAYETTE 2, INDIANA

Need more facts about advertised products? Mail your Readers' Service card now.

RESURFACING?

then save money with the original NEENAH manhole adjusting rings

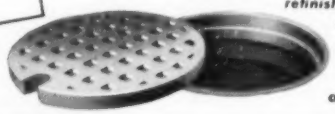
Neenah Foundry adjusting rings boost manhole cover flush with refinished roadway surface — may save as much as 80% of cost of digging and resetting to new grade. Cutaway view shows old manhole frame still in place after resurfacing — thanks to the addition of a Neenah adjusting ring. Available for square and rectangular frames and in standard and special sizes.



Adjusting ring added to existing manhole permits resurfacing for as little as 20% of the cost of replacing or raising existing frame.

Type A adjusting ring with vertical outside surface.

Type B adjusting ring with flared outside surface.



Existing manhole lid sets flush with refinished roadway surface after adding the cost-saving Neenah adjusting ring.

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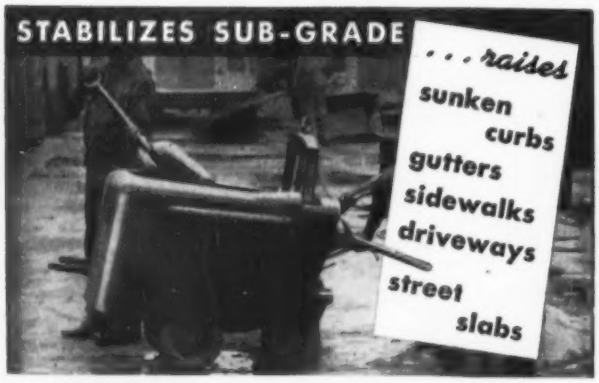

KOEHRING MUD-JACK® raised sunken slabs at city bus terminal (above) . . . stabilized sub-grade support under the paved parking area without interrupting traffic. Small holes were drilled through the pavement . . . then, Mud-Jack pumped inexpensive soil-cement slurry into the holes, raised the concrete, leaving solid, permanent support. Compact, portable as a 2-wheel cart, this No. 10 Mud-Jack is ideal for city work . . . no inconvenience to the public, no detours necessary. Also check the bigger No. 50 Mud-Jack for preventive maintenance and repairs on extensive highway work. Saves time, money and labor.

Send for 20-page engineering hand-book on Mud-Jack method of stabilizing sub-grades.

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FROM TRAILING TO ROLLING IN 5 MINUTES

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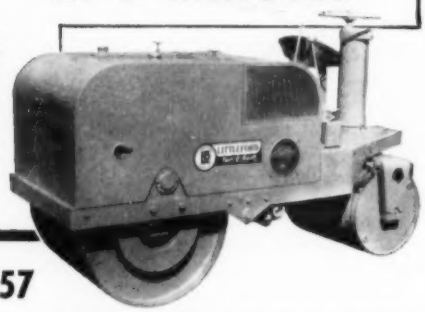

MODEL 157 PORTABLE TRAIL-O-ROLLER

The Model 157 Trail-O-Roller is a modern 2 to 3 Ton Roller designed to cut the cost of operation when rolling maintenance or construction jobs. Contractors and Highway Departments have in this Model 157 a unit that will give compaction from 75 to 160 lbs. To transport the Model 157 is simple, it travels on its own pneumatic tired wheels and is changed from trailing to rolling or rolling to trailing position by a Hydraulic Lift that eliminates all the manual labor. No separate trailer is needed with a Model 157 Trail-O-Roller. Being highly portable, this efficient roller will roll dozens of jobs in a single day. It saves time and money on any road or highway rolling job. For further details write for Bulletin No. 24.

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Mechanical Soil Stabilization

Mechanical soil stabilization is accomplished by blending the existing subgrade soil with other suitable soil to provide stability through internal friction, interlocking of particles and cohesion. Three essentials for success are proper gradation, a satisfactory binder soil, uniform blending of all materials, and proper compaction. The importance of adequate drainage and proper compaction cannot be overemphasized. The engineer should, with an open mind, experiment to determine the best combination of locally available materials. The author elaborates on the above, and discusses in detail the procedures of selecting materials, blending and construction. Laboratory control is important, and a list is given of the laboratory equipment desirable, and the methods of using it are described.

"Mechanical Soil Stabilization—A Tool for Providing Better Roads and Streets." By Leo J. Ritter, Jr. *PUBLIC WORKS*, March.

The Penn-Lincoln Limited-Access Expressway

The so-called Penn-Lincoln Parkway is really a multiple-lane highway 19½ miles long with access limited to 15 points. It includes two tunnels and a double-deck bridge. Completion will take at least 5 years more. Seven miles at the eastern end are now in use. Standards provide for maximum grades of 5%, max. horizontal curvature of 4° and a design speed of 60 mph. The outstanding project is Squirrel Hill tunnel—two parallel tubes 4,225 ft. long. Each tube has two 12-ft. one-directional traffic lanes and a sidewalk.

"Design is Complicated on Penn-Lincoln Parkway." *Better Roads*, January.

Training High-School Graduates for Highway Work

Stimulated by the scarcity of engineers, many state and county highway departments are employing young men (and women) highschool graduates and students for subprofessional duties. The majority give them on-the-job training, encouraging them to self-education outside working hours. Robley Winfrey, chief of training and education of BPR says: "A highway department should employ the high-school graduate, give him special training and encourage him to carry on a program of self-improvement. In the long run such a program will

New hi-performance Jaeger pump

Pumps all the water a 2" hose can handle . . .

at easy, long-life engine speeds.

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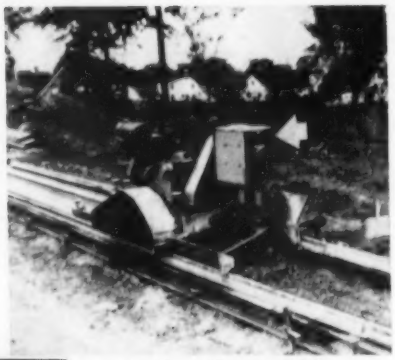

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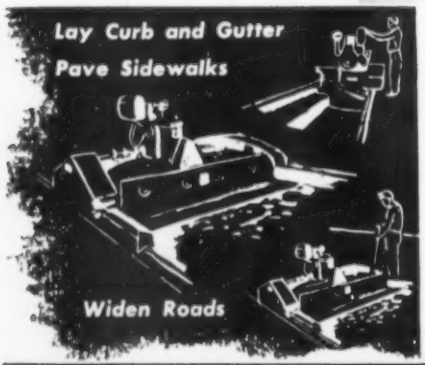

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staff a department of more men and better qualified men than a policy that does not encourage the hiring, training and promotion of high-school graduates." A number of highway officials describe the policies and methods of their departments, most of which find the results most gratifying.

"Training of High-School Graduates." *Better Roads*, January.

Other Articles

"Year-End Look at Roadbuilding." Trends in designing; toll roads, expressways; maintenance; equipment; legislation. By Harold J. McKeever, Editor-in-chief. Roads and Streets, January.

The West Virginia Turnpike. Location and construction under unusually difficult conditions. "Tough Terrain Conquered by Builders of West Virginia Turnpike." By C. H. Peterson, Project Eng. Civil Engineering, February.

Developing an urban arterial highway. "Ohio Procedure for Establishing An Urban Arterial Highway System." PUBLIC WORKS, March.

"Fluorescent Luminaire for Intersections Gives Results" developed by California Div. of Highways. By Roy Matthews, Sr. Elect. Engr., Traffic Dept. PUBLIC WORKS, March.

"Removing and Resealing Joints in Cement Concrete Pavements" by the Ohio Bureau of Maintenance. PUBLIC WORKS, March.

"Marking Striped Pedestrian Crossings, Materials for." Tests by British Road Research Laboratory. The Surveyor, January 30.

"Single Pass Soil Stabilization." Roads and Road Construction (England), February.

"Light-Colored Chippings Improve Surface Shades." By Herbert J. Manzoni. Municipal Engineering (England), Feb. 5.

"The Problem of Road Accidents." Causes and remedies. By J. J. Leeming. Contractors Record (England), Jan. 20.

"How Roadside Cleanup Is Handled by Counties." Reports from 500 counties. PUBLIC WORKS, March.

Training highway superintendents. "The Training of Future Highway Superintendents and Roadmen." By J. H. Arnison. Contractors Record (England), Jan. 20.

• • •

Sewage Treatment Data from San Francisco

Operating results from San Francisco's three major sewage treatment plants show 2.12 cu. ft. of screenings per million gallons at North Point, 1.80 cu. ft. per mg at Richmond Sunset, and 2.89 cu. ft. per mg at Southeast. Grit for these three plants was

2.2, 25.6 and 9.3 cu. ft. per mg respectively. The three plants handle some storm flow.

The cost of operation was $37.68 per million gallons, which does not include interest and/or amortization. Of the total operating expenses of $741,535, personal services accounted for $446,706; heat, light and power $99,974; contractural services $70,963; and materials and supplies $123,892.

• • •

Good Operating Results Shown by Cranston Treatment Plant

BUILT some 11 years ago, the plant at Cranston, R. I., is of the activated sludge type, with a design capacity of 7.67 mgd. Operating results for the year ending Sept., 1953, are contained in the excellent report sent us by Walter C. Anderson, Superintendent. During the year, average SS removal was 92 percent and BOD removal 93 percent. The sewage, approximately 75 percent domestic and 25 percent industrial waste, averaged 176 ppm SS and 233 ppm BOD. Primary treatment removed 57 percent of SS and 37 percent of BOD. Gas production averaged 14,132 cu. ft. per mg of sewage or 1.33 cf per person per day.

This is one of the relatively few plants that treats cesspool wastes. These are discharged into the inlet to the grit removal unit and are then passed through the plant processes. Average pH of these wastes was 6.2. From the city of Cranston, 612 loads were discharged, and from a neighboring community about 600 loads. Total volume of cesspool wastes amounted to 1.8 mg —only about 0.2 percent of the total sewage flow.

Plant scale experiments are being made in handling a portion of the highly alkaline wastes resulting from the city's textile industry. These include dye house wastes, kier liquors, and print shop, color shop and toilet wastes. Starting at 100,000 gpd, the volume handled by the plant was gradually increased to 700,000 gpd, which amount the plant appears to be able to handle fairly well. Daily average flow from all sources was 3.124 mgd. The addition of the textile wastes required an increased amount of air.

Digester operation is of interest. Digested sludge is drawn as required, elutriated and dewatered on vacuum filters. Several methods were tried to improve the quality of the supernatant liquor that is normally returned to the primary settling tanks. The latest method, suggested by Mr. Genter, consists of elutriating the supernatant to "degas" and concentrate the solids, which are then pumped to the second digester. A supernatant was obtained from the second digester which contained less than 0.5 percent solids and which could easily be returned through the primary tanks without any undesirable complications. Storage of sludge in the second digester helps to thicken it still more. Filter production was 3.23 pounds per sq. ft. per hr. for all sludges filtered. The overall ferric chloride requirement for both sludges averaged 5.61 percent on a dry solids basis.

Some years ago, an oil company made a detailed survey of lubrication requirements for all equipment in the plant and drew up a schedule to include the type of lubrication and the amount required per service period. This schedule has been strictly adhered to and the results of operation of the equipment have been excellent. Much of the equipment in use in the plant has been in operation in excess of 100,000 hours and is still in top condition.

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PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Treating Wood Pulp Wastes

For converting wood to cellulose fibers, two processes are in common use. The sulfite process uses calcium bisulfite and free sulfur dioxide. The kraft or sulfate process uses sodium sulfate. The latter can recover the cooking liquors more efficiently than can the former. For the sulfite process to relieve stream pollution by its wastes requires high capital investments. Scientists are endeavoring to find a method of utilizing the waste lignin, of which the kraft industry now burns 4,000,000 tons a year and the sulfite industry 1,500,000 tons. Probably greater effort has been made on the sulfite industry's waste disposal problem than on any other segment of the entire pulp and paper industry.

"Water and Waste in the Wood Pulp Industry." By Harold R. Murdock, Infilco, Inc. and H. W. Gehm, Tech. Advisor, Nat'l Council for Stream Improvement. *Sewage and Industrial Wastes*, January.

Laying a Sewer In a Deep Trench

A contractor for laying 1200 ft. of 48-in. concrete pipe at a depth of 38 to 42 ft. in open land, did so in open cut, using a backhoe which could dig effectively to a depth of 22 ft. or more. The top 20 ft. or so was excavated with a scraper, with sloping banks; then the backhoe was walked into the trench and dug the rest of the way. It cast onto the ground surface at first, but as the trench got deeper it cast onto a bench ahead of it in the trench, from which it was pushed to the ground surface with a bulldozer. At one place, running sand and water were encountered and here, to protect the workmen, the contractor used a steel shelter consisting of two walls and roof, open at both ends and the bottom, which was dragged along the bottom of the ditch and kept just ahead of the last pipe laid. The construction rate averaged about 60 ft. per 10-hr. day.

"An Edmonton Contractor Goes a Long Way Down." By A. J. Mair. *PUBLIC WORKS*, March.

Sewerage In 1953 and 1954

Sewage treatment plants of recent construction are generally of standard, conservative design. Exceptions are the works of the Allegheny County Sanitary Authority, sludge thickening at the Bowery Bay plant of New York City, and recirculation of digester gas in digesters at Washington, D. C. and Columbus, O. There has been a postwar trend toward more secondary treatment, more chlorination of effluent, more high-rate filters and modifications of the activated sludge process. Contracts for sewage works construction totaling close to $475 million may be let this year.

"Techniques and Trends in Water Supply and Sanitation." *Engineering News-Record*, Feb. 18.

Spreading Wet Digested Sludge

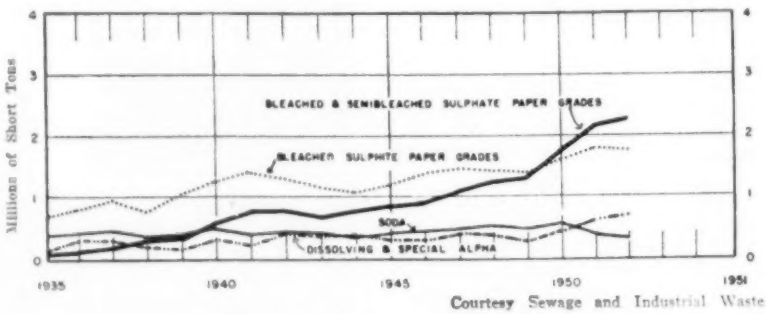
Marshall, Mo. has discontinued use of beds for drying its digested sludge, and instead for 2½ years has spread wet sludge on farming land. This it can do at any season of the year. For spreading, it uses an iron tank 74 x 100 in. by 50 in. high, provided with five valved outlet pipes in the rear end. This is mounted on a 4-yd. dump truck, which permits tipping it for spreading the sludge and washing the tank. This tank is used also for hauling water for settling trenches, and for sprinkling streets. It can be removed from the truck in 30 minutes.

"Disposal of Wet Digested Sludge at Marshall, Missouri." By Henry Hayob, Supt. *Sewage and Industrial Wastes*, January.

Lagoons in Sewage Treatment

A lagoon, with sufficient holding time, will provide excellent treatment but should be used only after removal of the health hazard. To the author's knowledge, North Dakota is the only state permitting the treatment of raw sewage in a lagoon. Their use for final treatment will increase as the need for higher degrees of treatment becomes imperative. A lagoon must be placed at least a mile from town and half a mile from the nearest house. In Minnesota the customary treatment plant, using the best in design, is comparable in cost to lagoons.

"Evaluating the Use of Sewage Lagoons." By Robert J. Ellison and R. L. Smith. *PUBLIC WORKS*, March.



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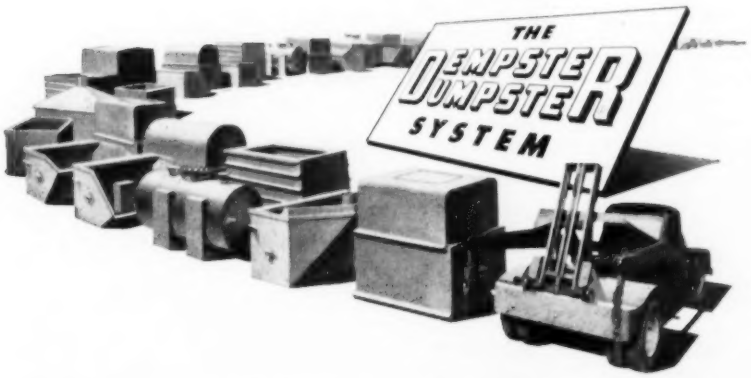

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Metallizing in Treatment Plants

Marshalltown and Fort Dodge, Ia. tell why and how they have used metallizing or metal spraying in their treatment plants. Marshalltown in 1946 metallized all the air pipes and diffuser plate assemblies in the aeration tanks, which were badly corroded after four years' use; since then no corrosion has been noticed. The cost for materials was 22 to 23 ct. per sq. ft. Later, weirs, troughs and sludge removal mechanism in the final clarifiers were treated at a cost for materials of 17.5 ct. per sq. ft. Metallizing was used also to build up worn places in sludge pump pistons. The superintendent at the Fort Dodge plant considers metallizing an economical means of preserving almost every type of equipment around a sewage treatment plant. However, sometimes replacement would be cheaper. He describes the equipment and methods employed, and the occupational diseases involved—lead poisoning, metal fume fever and silicosis—which can be prevented by taking proper precautions.

"Metallizing Experience at Two Iowa Plants." By L. F. Skorczeski and D. D. Douglas, Superintendents. *Sewage and Industrial Wastes*, January.

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Sewage Treatment For Miami, Florida

Miami is constructing a $27,000,000 sewage disposal system. Only about a third of the area and half the population is now sewered, the rest being served by septic tanks. At present there are 72 sewer outlets and 22 pumping stations. To intercept the flow from these outlets, intercepting sewers will be built 4 to 22 ft. deep; also four pumping stations, two of which will pump the sewage 16,950 ft. across Biscayne Bay to a treatment plant on Virginia Key. The 72-in. force main will be laid 15 to 28 ft. below mean water level, covered with 5 ft. of protective material, and provided with pressure-type manholes at intervals of 1600 ft. The high-rate activated sludge treatment plant will have an initial capacity of 47 mgd. It will have aerated grit channels, Parshall flumes, spiral-flow aeration tanks, and final settling tanks. The excess sludge will be chlorinated, concentrated and digested, elutriated and vacuum filtered, flash dried and incinerated, and the ash flushed into lagoons. The outfall pipe, 108-in. on land and 90-in. under water, will end in multiple outlets in 18 ft. of water 4590 ft. off shore.

"Sewage Treatment for Miami." By C. E. Wright. *PUBLIC WORKS*, March.

Refuse Disposal At Rochester, N. Y.

Rochester is building two incinerators to destroy all its combustible refuse. These will replace garbage reduction and salvage, and burning of rubbish, which have been practiced for over 40 years. It now is necessary to haul ashes and other incombustibles ten or more miles to landfills in adjacent towns. The quantity of garbage and rubbish to be disposed of will, it is estimated, total 140,000 tons a year. The furnaces will be Nerco Monohearth units, charged by cranes from storage pits. The collection equipment for wrapped garbage and household rubbish will be of the enclosed compacting type. For the bulky rubbish, auto trucks having open bodies of 20 cu. yd. capacity will be used. For seven months the city has been trying out twelve collecting units of four makes to determine which is the most desir-

Lithographed on stone for U. S. Pipe and Foundry Co. by John A. Noble, A. N. A.

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"Garbage Reduction — Land Fill Replaced by Incineration." By John V. Lewis, Director, Pub. Wks. Dept. *Wastes Engineering*, February.

Storm Water In Sanitary Sewers

The Milwaukee Metropolitan Sewerage Com'n has control of 155 miles of main intercepting sewers. During periods of excessive rainfall certain parts of the system are subject to serious surcharging and many basements are flooded. Methods by which storm water finds its way into the sanitary sewers include infiltration, foundation drains, roof downspouts, surface water entering manhole covers, cross-connections, inadequate drainage. All of these can be wholly or partly avoided in future construction, but little can be done to eliminate infiltration due to several of them in existing sewers. More or less leakage through sewer joints and manhole walls is unavoidable, the average amount of such leakage being estimated to be about 800 gpd per acre. At 5 houses per acre, their foundation drains might contribute an amount equal to the designed sanitary flow. The downspout runoff from five or six houses equals the capacity of an 8-in. sewer. Insufficient surface drainage which results in flooding of streets may cause water to enter manhole covers. These sources can be at least partly eliminated by adequate storm water drainage, assisted by pumping if necessary, to remove storm water quickly to streams. In some cases, pumping can be avoided by lowering or clearing out stream beds. Other remedies include refusal of excessive flow at interceptor connections, and elimination of illegal connections.

"Reduction of Excess Sewage Flows at Milwaukee." By Raymond D. Leary, Chf. Eng'r. *Sewage and Industrial Wastes*, January.

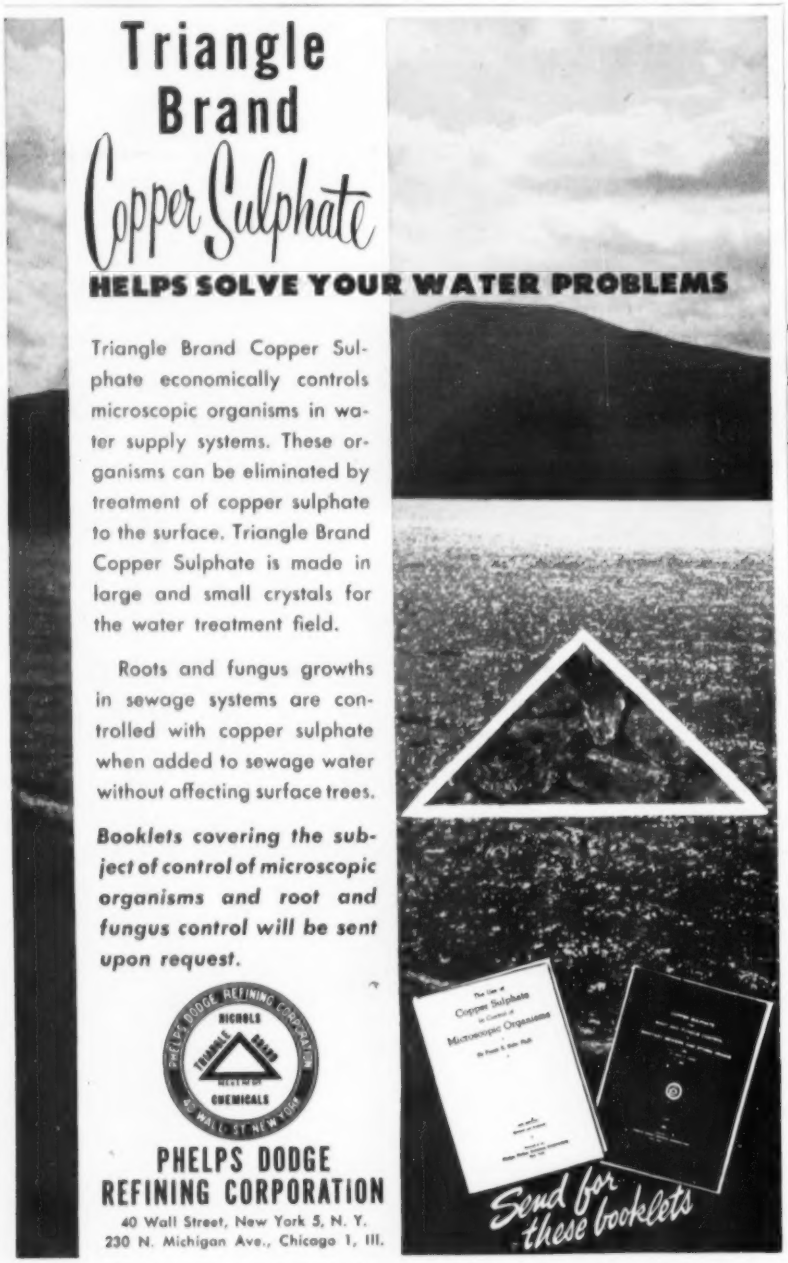
Treating Fine Chemical Wastes

Pilot plant studies at the Stonewall plant of Merck & Co., Inc. indicate that combined liquid wastes from the manufacture of antibiotics, vitamins and sulfa drugs can be treated satisfactorily by trickling filters. The cost is considerably less than that of evaporation and incineration equipment. Land disposal of the sludge from trickling filter treatment is feasible and might be preferable to anaerobic digestion or filtration and incineration.

"Trickling Filter Studies on Fine Chemical Wastes." By F. E. Reimers, U. S. Rinaca and L. E. Poese, Merck & Co., Inc. *Sewage and Industrial Wastes*, January.

High-Rate Activated Sludge

During the past six years there have been conducted in Switzerland experiments in a pilot plant for studying the possibilities of high-rate activated sludge treatment of domestic sewage. The pilot plant was situated within the municipal sewage treatment plant of the city of Zurich. The sewage treated was the effluent of plain sedimentation. The mean water consumption of the city is about 100 gpcd. The concentration was about that of American cities. A principal aim of the experiments was to determine a continuous relation between BOD concentration of raw sewage, hydraulic load of the plant, and BOD concentration of the final effluent. They showed that, with hydraulic loads up to 164 gpd per cu. ft., BOD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reduction of at least 80% can be achieved if there is a sufficient concentration of solids in the mixed liquor. It may be that the breakdown of certain compounds in sewage needs a minimum time regardless of the amount of sludge applied. It may be that tapered aeration and step aeration would only prove their full value at much higher load ranges than those that have been investigated. Reduction in nitrogen and phosphorus, important because of their effect on receiving bodies of water, decreased slowly with decreasing aeration periods. As far as plant operation is concerned, high-rate plants are as stable as conventionally operated ones.

"High-Rate Activated Sludge Treatment and Its Relation to Stream Sanitation." By K. Wuhrmann, Swiss Federal Institute of Technology. *Sewage and Industrial Wastes*, January.

Treatment Of Duck Wastes

Several hundred thousand ducks are raised annually in ponds on the shores of Moriches Bay, Long Island, and the polluted water flowing from these ponds into Long Island Sound presents a serious problem. This is being studied in 6 pilot installations by the New York State Water Pollution Control Board, which reported that the operation of these during 1953 showed that alternating lagoons have proved effective in removing 98 to 100% of the settleable solids.

"Alternating Lagoons Remove Solids from Duck Wastes." *Wastes Engineering*, February.

Other Articles

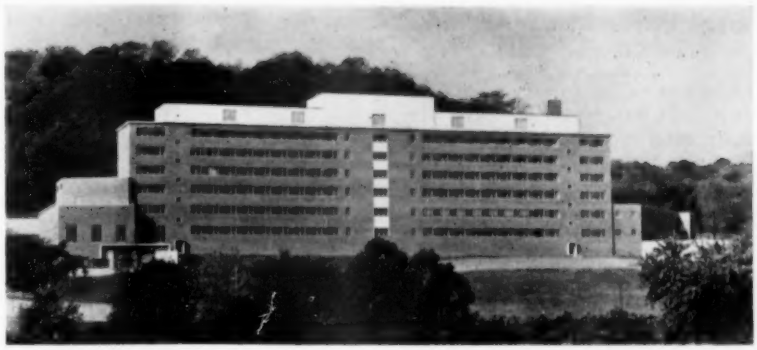
Equipment for sewer maintenance necessary. "Sewer Maintenance Problems Solved by Proper Equipment." By Sol Seid, Engr., Dept. Pub. Wks., New Brunswick, N. J. Wastes Engineering, February.

"Sewer Pipe Roughness Coefficients." Tests on clay and asbestos cement pipe. By Kenneth W. Cosens, Ass'n. Prof. San. Eng., Ohio State University. Sewage and Industrial Wastes, January.

"Sanitary Landfill Costs 63.4 Cents per ton of Refuse" at Eagle Pass, Texas. By B. R. Fuller, City Mgr. PUBLIC WORKS, March.

Sludge drying beds, instructions for operating. "How to Get the Most From Your Sludge Drying Beds." PUBLIC WORKS, March.

"Sewage Plant Design, Difficult Terrain Complicates." By Guy Browning Arthur. PUBLIC WORKS, March.



● **SANITARY Engineering Research Center of the Public Health Service, to be opened this month, will provide exceptional facilities for needed research.**

Public Health Service Dedicates Sanitary Engineering Research Center

DEDICATION ceremonies for the new 4-million dollar building of the Public Health Service just out of Cincinnati will be held April 8. This new building will house the Sanitary Engineering Center of the PHS, which is the focal point in the government's research program on environmental sanitation—air, water, food, radiation, etc. With a floor area of nearly four acres, this building is especially designed for research and laboratory work. Each standard unit of space is 12 by 18 ft., and is provided with high and low voltage electricity, hot and cold water, steam, compressed air, vacuum and gas; and has acid resistant waste lines. Lighting is designed to provide 50 ft.-candle intensity at laboratory bench level from fluorescent fixtures. Filtered air circulation is provided through most of the building, with a separate air supply and exhaust for the animal quarters.

The water and waste experimental wing has an area of 3600 sq. ft. and provides space for studies on a pilot plant scale. It is equipped with a 5-ton overhead crane with 37 ft. of headroom so that plant equipment may be moved readily. Raw water from the Little Miami River will be pumped to this wing and city sewage is available from the Cincinnati sewerage system.

The research program, which will be transferred to this building, has steadily broadened in scope in recent years. In water supply, attention is being given to the control of such water-borne virus diseases as infectious hepatitis, to the problem of water-borne toxins generated by algal growth, and to the development of rapid, automatic and mechanical means of detecting and measuring contaminants in air and water by the use of electronic techniques. Other projects include the development and application of the molecular filter, which appears likely to take an important place in water supply and purification. In waste treatment, studies are being made of processes for sewage and industrial waste treatment, the latter in collaboration with industry associations, individual plants and others in this field. Also of great value has been the training program for state and local health workers in advanced sanitation and radiological health subjects. In the past five years, 160 training courses have been conducted which were attended by more than 6300 public health specialists.

A few of the current projects now in process are: Studies of industrial waste sources, characteristics and corrective measures; evaluation of municipal sewage treatment processes; application of biological methods to the treatment of radioactive wastes and to aircraft cleaning wastes; studies of the methods of removing radioactive materials from water; effects of chlorine disinfection on the inactivation of Coxsackie virus in water; identification and control of organisms producing nuisance conditions in water supplies; studies of the relationship between bathing water and health; and application of infrared absorption spectrophotometry to the rapid identification of microorganisms.

Vernon G. MacKenzie, a sanitary engineer of the Public Health Service, is the officer in charge.

Sewage Disposal Plant Additions at Clinton, Okla.

Addition to the sewage treatment plant at Clinton, Okla., have recently been completed. The original plant was built in 1935 and was designed for a flow of about 600,000 gpd. The new plant additions include a duplicate grit chamber with comminutor; a diversion box with a low-head Venturi for measuring the sewage flow and dividing the settled sewage 40 percent to the old filter and 60 percent to the new; a new circular secondary clarifier and a new digester, with 30,000 cu. ft. capacity, stirring mechanism and gas collection and utilization system. The new filter is 120 ft. in diameter and 8 ft. deep. The old unheated digester was converted into a second-stage unit. A sludge drying bed area of 10,000 sq. ft. has been provided. The plant site is surrounded by a 6-ft. high fence.

• • •

"Jack" Ritter

(*Continued from page* 16)

of Roadside Operations." This is a little different from most, in that it consists principally of pictures and brief descriptions of equipment. It is a summary of the reports on equipment for roadside operations by a special project committee of the Committee on Roadside Development, of which Wilbur Garmhausen of Ohio is chairman.

Parking—An aspect of the parking problem which has not received too much attention is discussed in *American Highways* for January, 1954, in an article entitled "Utilizing Areas under Bridge and Freeway Structures", by George T. McCoy, State Highway Engineer of California. The article deals with the successful application of the principle that the space beneath elevated structures in urban areas can be developed to provide badly needed parking space. Utilization of these spaces must be such that required maintenance space is not interfered with, the safety and comfort of the motorist is not threatened, and that the structure itself is not endangered. Frequently, utilization of the space as a parking area satisfies these requirements and, in addition, provides both social and economic benefits. The idea is not completely new, since this has also been done in other areas, but Mr. McCoy's discussion is both pertinent and timely.

From Here and There — Enjoyed a brief visit with Don Gehring of the Wire Reinforcement Institute last month in New York; he was showing a short, but interesting, movie about the use of welded wire fabric in asphaltic concrete. The Armco people have been nice enough to send us their small exhibit which demonstrates principles and materials used in highway drainage. We have it on display at N.Y.U. Incidentally, our working office is in Bliss Building at the uptown campus of New York University, way up in the Bronx. Give us a ring when you're in town. Something generally overlooked is the fact that, although the total number of fatalities in highway accidents remains at a high level, the rate of occurrence of this type of accident is dropping steadily. For example, the rate was 7.3 deaths per 100 million miles of vehicle travel in 1952, less than half the rate experienced in 1937. The average motorist, including yours truly, is currently getting a break in northern New Jersey, since we are enjoying a price war which has brought the price of regular gasoline down to 21.9 cents per gallon.

Miscellaneous—A study by the Engineering Experiment Station at the University of Arkansas has come

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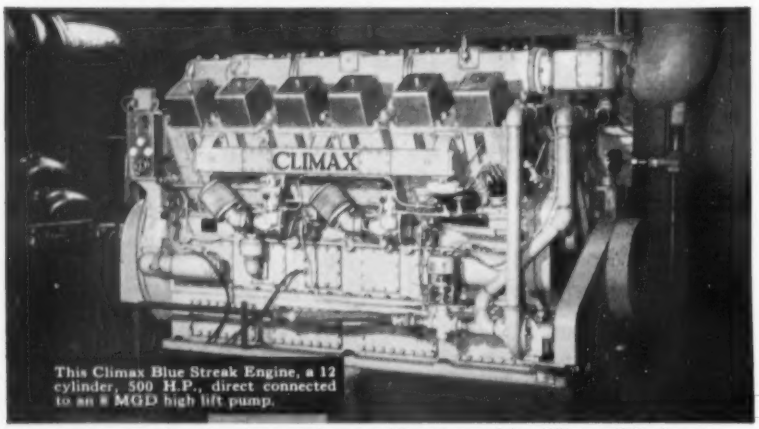

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up with conclusion that "no highway in Arkansas has enough traffic to justify a toll road." Not so in New York state, where Governor Dewey is asking for some $300 million more to finish the New York State Thruway (total $800 million plus), and also has asked the legislature to consider authorizing four more toll roads in the state. About one-third of all federal-aid funds authorized for primary roads and nearly one-half of those authorized for urban highways have been used in improving segments of the National System of Interstate Highways, according to the latest annual report of the Bureau of Public Roads. With competition for this year's engineering graduates in full swing, we're at least a little encouraged in that several of our day division seniors in civil engineering definitely plan to enter the highway field, preferably with a state highway department.

• • •

"Doc" Symons
(*Continued from page* 14)

sewage works there, then) and my first job in a sewage works was in Decatur.—My old home town.

★ ★ ★

Small World No. 25 — Herb Hall, formerly of Dorr Co., is now associated with their representatives John Lindsay, in Caracas, Venezuela, who also represents B-I-F Industries. In connection with this latter representation, Hall recently visited George Kelsey, President of Builders-Providence.

George was telling Herb of plans to spend the summer at Bridgehampton, Long Island. Hall replied, "I have a summer place in Water Mill, a couple of miles from there."

"That's interesting," said George, "I used to live in Water Mill; spent ten summers there, in fact" and then he proceeded to draw a diagram of the house and its location, saying, "It was a gray house with blue trim".

"That's my house", said Hall.
—Small World!

★ ★ ★

I Read Somewhere — From a high school examination in San Mareno, Calif.

"How does rain water differ from tap water?"—"Rain water contains dissolved hydrogen and may explode."

"What is hard water?"—"Hard water is water with less oxygen than regular water."

As some wit, probably Will Rog-

ers, has said, "It is not that we know so much, but that we know so much that isn't so."

★ ★ ★

What will they think of next??? —Irradiated heat and break-resistant plastic pipe and fittings for household plumbing, so they say.—For water services, too???

★ ★ ★

Now that Lou (Transite Pipe) Frazza, of New Jersey is vice president of the Northeastern Section of the Nat. Soc. of Prof. Engrs., I suppose I shall have to be more respectful to him.—Oh No!!

★ ★ ★

I See Where — The Allegheney County Sanitary Authority will use two-stage progressing cavity pumps (Moyno pumps, to you and me) for moving concentrated sludge.

★ ★ ★

Did you know—In the first 163 years of this Country, Congress passed 70,124 laws, or 430 a year.—That's one for every week day and two on Sundays and holidays. About 44 percent of these were public laws, the others for the relief of individuals—and the law that relieves a man of his income is the best known.

★ ★ ★

News Notes from Brushy Bend

—The Sanitary Engineering Group of the Metro. Sect. of ASCE met on Feb. 3 to hear C. A. Rogus and Maurice Feldman of N.Y.C. Sanitation Dept. talk on "Sanitary Landfills."

—Third Annual Ohio Water Clinic Conference was held Feb. 11 & 12, at Ohio State University. Topics included radioactive wastes, phenol tastes and odors, disposal of lime-softening wastes, etc.

—Feb. 17 was the date of the quarterly meeting of the Central Jersey Sect. of NJSIWA in the Colonial House in Middlesex. Luncheon was sponsored by Borough of Middlesex officials.

—Annual meeting of the Illinois Sewage Works Operators Conference was held in Springfield on Mar. 9-10. Presider was Jack Beatty, Supt. of Urbana-Champaign San. Dist.

—Final meeting of the North Jersey Water Conference is scheduled for April 2, at the Paterson YMCA. Charlie Capen (Ex-prexy of AWWA) will be guest speaker.—On Mar. 19, Allen Hopper of Turbine Equipment Co. spoke on "Selection of Small Pumping Units."

V. T. Y.—Doc Symons

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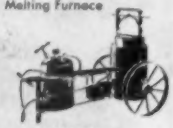

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EQUIPMENT NEWS

Published Monthly **April, 1954**

Elevator Attachment for Motor Graders

Hancock Manufactures Special Unit for Use with Allis-Chalmers Graders

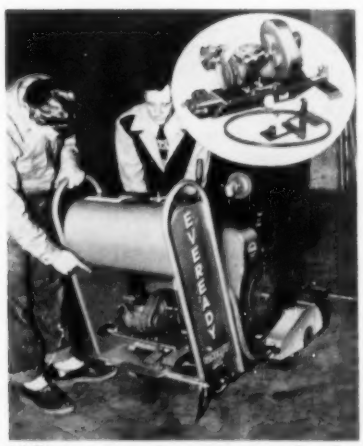
A newly designed elevator attachment with capacity ranging up to 1,200 yards an hour for side-casting or loading trucks, depending on soil and ground conditions, is now available for Allis-Chalmers AD-30 and AD-40 motor graders. It can also be mounted on the two preceding models, AD-3 and AD-4. The new unit developed by the Hancock Manufacturing Company, Hitchcock, Texas, is sold exclusively through Allis-Chalmers industrial dealers.

The main frame is a single unit which is mounted quickly and easily at three points on the grader. The plow beam is adjustable for different positions of the standard 30-inch disc which also has adjustments for wearing positions. The live power take-off is directly connected to the engine drive shaft through V-belt sheaves to the heavy-duty clutch. This drives the 42-inch wide conveyor belt.

Make your motor grader into an elevating grader with this attachment.

Length of the conveyor is 19 feet, with a 3-foot extension available as an extra. The conveyor can be shortened to 16 feet by removing a 3-foot length. The hinged conveyor folds at the center to a vertical position for transit. Write the manufacturer or circle No. 4-1 on the coupon.

Concrete Saw Has Variable Speed Transmission



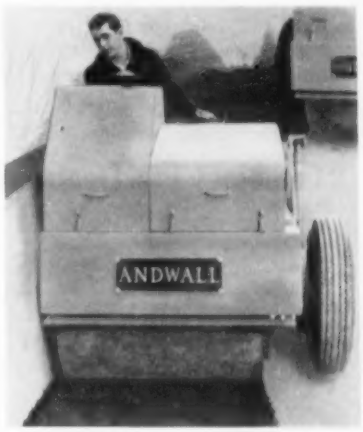
Ability to cut in corners and other close areas is advantage of this saw.

This new self-propelled concrete saw moves at a controlled speed, two abrasive coated wheels acting to drive it. The variable speed transmission can be infinitely regulated to drive the saw from 0 to 12 ft. per minute. Drive is quickly engaged or disengaged by a convenient foot lever. It is claimed that this saw gives increased cutting footage per day, with less work for the operator and with increased blade life.

Dash-board controls are provided for operating and maneuvering ease; a dual blade shaft permits placing the blade on either side for sawing in corners and confined areas. More data from Eveready BriKsaw Co., 1509 S. Michigan Blvd., Chicago 5, Ill., or circle No. 4-2 on the coupon.

Roller Compacts Close to Curb or Wall

The Andwall Manufacturing Company, has a two-ton roller capable of surfacing within 1¼ ins. of curbing, wall, or any other vertical obstruction. This roller will handle a variety of jobs—alleys, parks, industrial plants, parking lots, service stations, school yards; it is especially good for patch work where ease of maneuverability and close work is important. For trailing behind a truck at any speed, the hydraulic lift raises the 36-inch 4100-lb. roller off the ground. Wheels with pneumatic tires support the roller for quick transport.



Getting close to a wall or curb is easy with this portable motor roller.

The Andwall roller concentrates its weight on the main roller and provides a compaction pressure of 110 lbs. per lineal inch. The water drum capacity is 800 lbs. and the tank holds 220 lbs. The roller is powered by an air-cooled Wisconsin motor. There are no gears to shift and no complex clutch adjustments. For further information, write Andwall Manufacturing Co., Oconomowoc, Wisc. or circle No. 4-3 on the coupon.

Oliver Hydro-Trencher Digs to 10 Feet Deep

A newly designed half-yard Hydro-Trencher and Swing Loader combination has been announced by The Oliver Corporation for their industrial model "88" wheel tractor. The unit will dig to a depth of 10 feet and load to a height of 10 feet 6 inches. An optional boom cylinder increases the digging depth to 12 feet, and an optional loading bucket with hydraulically controlled trap door permits loading to 12 feet.

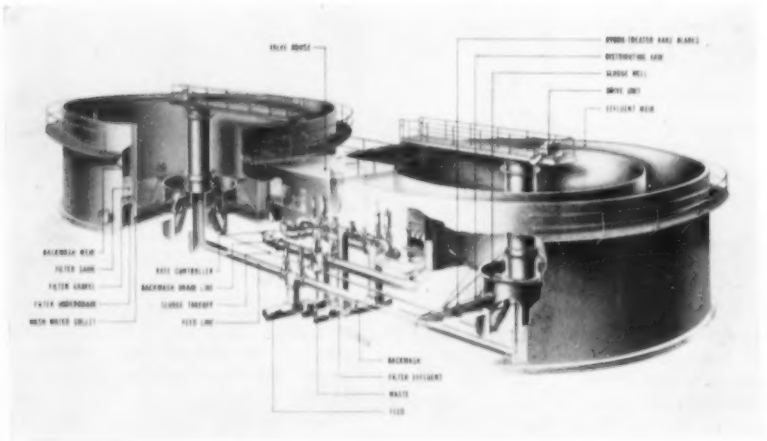
Extremely valuable in trenching tasks, is the feature of all-hydraulic operation. Hydraulic pressure applies tremendous down force on the boom for digging through rocky soil, roots or other stubborn conditions. In addition to trenching work, the Hydro-Trencher converts to an efficient swing loader in a few minutes simply by turning the bucket around. No special tools or additional parts are needed.

Among the other features of the Hydro-Trencher are: exceptional bucket rotation that permits clamping rocks or dirt loads against the boom to prevent spillage when loading; full 200° boom swing and long side reach; preset boom relief valve for constant digging power; and simple, fast-acting finger-tip controls.

Ability to apply tremendous "down" force helps in tough trenching jobs.

A new folder on the Oliver 88WT Hydro-Trencher is available through any Oliver Industrial Distributor or by writing to: The Oliver Corporation, Merchandising Dept., 400 West Madison Street, Chicago 6, Illinois, or circle No. 4-4 on the coupon.

Combines Pre-Treatment and Filtration of Water



The Dorr Company announces The Dorrco Aldrich PeriFilter System for the pre-treatment and filtration of municipal and industrial water supplies in a single unit. Color, hardness, iron, manganese, or turbidity is removed from the raw water in a mechanical pre-treatment unit and residual turbidity and bacteria in an annular rapid sand filter.

For normal applications the pre-treatment mechanism will be a Dorrco Hydro-Treator. The annular rapid sand filter differs from conventional rectangular filters only in its peripheral placement with reference to the pre-treatment mechanism. Raw water, filter effluent, sludge, backwash water, and backwash drain flows are controlled by valves sheltered in a valve house adjacent to the purification unit; one such house may serve as many as four operating units.

The manufacturer claims the major advantages of the system stem from its ability to perform both pre-treatment and filtration in a single, compact unit. Initial installed costs may be reduced as much as 40 percent as compared with conventional plants, and operating costs will normally be lower because of decreased head losses through the plant and simplified operation.

This system is available as a complete assembly, which can be designed into any water purification plant. Each individual unit includes pre-treatment mechanism, filter bottom and sand, steel tanks and walkways, hydraulic valves, rate controllers, instruments and panel boards. Single standard units are now available in capacities of 0.1 to 5.0 MGD. Where adequate treated water storage is available, a single unit will suffice. More from The Dorr Co., Stamford, Conn., or circle No. 4-5 on the coupon.

• • •

1200 Watts of Auxiliary 110-Volt Power From Alternator-Equipped Cars and Trucks

A three-phase transformer, newly developed by The Leece-Neville Company, Cleveland, Ohio, makes it possible to obtain up to 1200 watts of auxiliary 110 volt d.c. power to operate tools and appliances in automotive vehicles equipped with the Leece-Neville alternator system in place of conventional d.c. generators. The new transformer permits operating electric drills, small chain saws, pneumatic tools, electric blankets, artificial respirators, traffic signals, flood lights, etc., direct from a utility truck, construction machine or fire or police emergency vehicle. Unlike the presently available 250 watt 110 v. a.c. transformer (which delivers a frequency equal to 1/10th alternator r.p.m.), the new unit's output is independent of motor speed.

The new transformer (along with a companion 110 v. selenium rectifier) is operated in parallel with the standard rectifier and voltage regulator, leaving undisturbed operation of the alternator for its primary purpose. Two models are available: for 6 volt systems, the 1013-T unit is rated at 800 watts; for 12 volt systems, the 1012-T unit has an output of 1200 watts. More from Leece-Neville or circle No. 4-6 on the coupon.

New Designs Mark Lessmann Loadalls

Design improvements of all three models of the Loadall have been announced by Lessmann Manufacturing Company, Des Moines, Iowa. The perforated grill and fabricated hood has been replaced with a cast grill with horizontal louvers. In addition to better appearance, the design change provides greater protection for the front-end Vickers hydraulic pump assembly.

The HF-15 Lessmann Loadall is 11½ inches longer and 1200 pounds heavier than the standard HF-10 and is equipped with full reversing transmission as standard equipment. On the HF-10 and the HF-5, full reversing transmission is optional. All three models of the Lessmann Loadall may now be equipped with an all-steel, all-weather cab with windshield wipers and safety glass.

The HF-15 unit carries 13.00 x 24-8 ply grader type rear tires and 8.25 x 20-10 ply tires on the front. It is an all purpose ¾-yard loader that may be equipped with buckets up to 1½-yard capacity for handling bulky materials. Optional equipment on the HF-15 includes Bendix Hydro-Vac brakes and Vickers power steering.

Drawbar, work lights, rear safety light and starter are standard equipment. A dozer blade, easy-on lift forks and crane hook are also available as optional equipment for all three models. For further information, write the manufacturer or circle No. 4-7 on the coupon.

One of the line of improved Lessmann Loadall tractor-loader units.

This unit is mounted on the Allis-Chalmers HD-9F Crawler Tractor and joins its two larger companion machines already in the field, the TSB-15 and TSB-20 side booms. Two major features in this unit are new to the side boom field. The first is a front-mounted power take-off, with power taken from a live shaft so that the side boom works indipendently of the tractor master clutch. This leaves the back of the tractor free for installation of a winch or other rear-mounted equipment.

The second new feature of the TSB-9 is the twin clutch arrangement on the power take-off. By merely pulling one lever, the operator can change from "raise" through "neutral" to "power down" on either the load or boom line. No gear shifting is necessary. This results in an added safety feature in that the operator does not have to shift gears to change from raise to power lower; he can act quickly in any emergency. Full data from the manufacturer, or circle No. 4-9 on the coupon.

• • •

Snow-Blowers Available for Hough Tractor-Shovels

The Frank G. Hough Co., Libertyville, Illinois announces that two makes of snow blowers are available for front-mounting on Hough "Payloader" tractor-shovels. The snow blowers are both of the self-powered type for front-mounting in place of the bucket; have gathering screws and blower; and are designed so they can load trucks and also blow the snow clear of the highway. They are available for Model HF (¾-cu. yd.) and larger Payloaders. The manufacturers are Brede Products, Inc., 2211 Broadway NE, Minneapolis 13, Minnesota and Krause Industries, Baraboo, Wisconsin. Further information concerning either of these snow blower attachments can be secured from the manufacturers, the Frank G. Hough Co., Seventh Street, Libertyville, Illinois, or by circling No. 4-8 on the coupon.

• • •

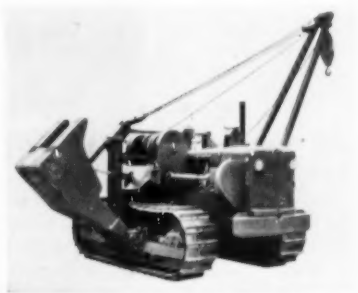
Tractor-Mounted Side Boom for Pipe Laying

A new side boom for a crawler tractor, with a 38,000-lb. lifting capacity at 4-ft. overhang is announced by Tractomotive Corporation, Deerfield, Illinois. It is the Model TSB-9 for the Allis-Chalmers HD-9F Tractor. Contractors and cities who work on sewers, conduits, water mains, or any other job requiring big capacity, mobile lifting power, will find many uses for the new side boom.

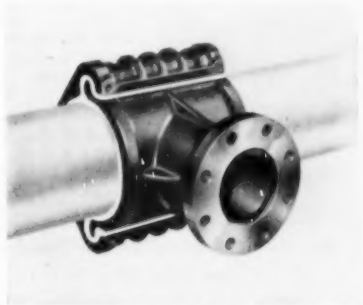
Boltless Tapping Sleeve for Cement-Asbestos Pipe

A boltless tapping sleeve for cement-asbestos pipe has been developed by the Corey Mfg. Co. Elimination of the usual calking process and the simplicity of installation makes it possible for even unskilled workmen to make a new installation or a tapping sleeve replacement in a few minutes. Less working area is required and less excavation; and it is possible to work close to other pipe or conduits. Water-tested in excess of 1700 psi, the new sleeve gives leak-proof performance. Sleeves are furnished in a considerable variety of tapped and flanged outlets. More data from Corey Mfg. Co., Dept. 4, Los Angeles 65, Calif., or circle No. 4-10 on the coupon.

A bit late for this year, we hope, but another winter will be coming.

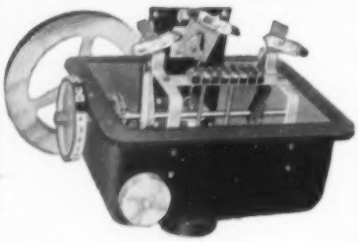


Many uses in pipe-laying for this powerful side boom for your tractor.



Bolts aren't needed for this new sleeve for cement-asbestos pipe.

ROTO-TROL



RF-2

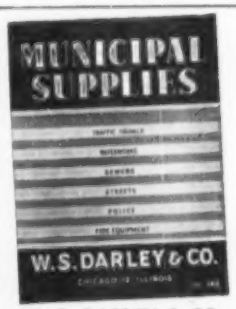
with ALTO-TROL

Puts that second pump to work.

A 2-pump RF-2 ROTO-TROL with a built-in ALTO-TROL will operate each pump on alternate starting cycles, assuring equal use and wear of both pumps. Operates both pumps when required. FLOAT-CONTROLLED. Depth Indication optional — extra.

Write for full data.
Water Level Controls Division

HEALY-RUFF Company
791 Hampden Ave., St. Paul 4, Minn.



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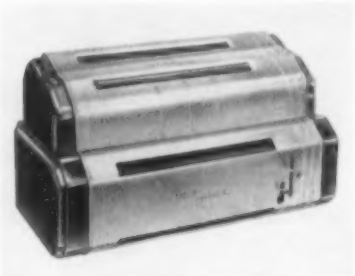
Complete Photocopy Unit in Small Compact Cabinet

A new all-in-one photocopying machine is a complete department in a single cabinet, less than 21 ins. by 10 ins. by 11 ins. high. Here's how it works: The original to be copied is fed in along with a sheet of No. 1 paper; the No. 1 and No. 2 papers are then passed through the auto-stat and the operator peels the two sheets apart. That's all there is to it—no developing, no fixing, no drying, no chemicals. Every detail is reproduced in black and white in 30 seconds; easily makes 100 copies an hour. Sheets up to 11 by 17 ins. are handled and there is no limitation as to type of papers, or whether printed on one side or both. Full details, including descriptive booklet, from American Photocopy Equipment Co., 1920 West Peterson Ave., Chicago 26, Ill., or circle No. 4-11 on the coupon.



This little outfit will reproduce drawings, diagrams or most anything else.

• • •

Kerosene Burning Flood Light has 5,000-CP

This floodlight projector is weatherproof and burns 40 hours on six pints of ordinary kerosene or No. 1 diesel oil. It produces a white light of 5,000 cp, and throws a beam approximately 150 by 75 ft. It is mounted on a 5 to 8-ft. telescopic tripod with revolving base. Fine for civil defense or for water, sewer, street or other night emergency repair work. More from Wm. W. Lee & Son, 20 E. Jackson Blvd., Chicago 4, Ill., or circle No. 4-12 on the coupon.

• • •

Retractable Wheel Tandem Roller with Variable Weight

Galion variable weight (4 to 6-ton) tandem rollers now have hydraulically retractable roller bearing, rubber-tired transport wheels which permit speedy and safe towing behind any truck. Both steering and compression rolls can be filled with water ballast. With its variable weight, the 4-6-ton tandem can meet any specification requirements for compressions ranging from 144 lbs. up to 206 lbs. per inch of roll width. Other advantageous features are hydraulic steering, spur gear final drive, constant mesh transmission, extra large diameter compression roll and 25-hp gasoline engine. Full data from Galion Iron Works & Mfg. Co., Galion, O., or circle No. 4-13 on the coupon.

The high volume air sampler employs a turbine type blower. It is designed for 24-hour sampling and has a rugged cast aluminum housing, keeping the weight down. The prime purpose of these units is for sampling large volumes of air for particulate matter by means of a filter paper. The sampler has been used successfully to sample air containing particles as small as one hundredth of a micron in diameter. This unit was developed in the laboratories of the New York office of the Atomic Energy Commision and has been manufactured in large quantities for this agency by the Staplex Co., Air Sampler Div., 777 Fifth Ave., Brooklyn 32, N. Y.

A torrential type roof drain, the "leveleze," has been announced by Josam Manufacturing Co., Michigan City, Ind. This drain is designed for installation on flat roofs of any construction in localities subject to heavy rains and torrential storms, where free ample drainage area is required for quick storm drainage and where a deep sump is necessary to hold excess water before entering leaders. The leveleze feature permits raising or lowering the roof flange to meet the required insulation thickness, even after the leaders have been installed and the roof laid.

A greater range of models in their 1954 line has been announced by the Autocar Division of the White Motor Company, Ardmore, Pa. The additional models will give more varied choice in chassis, engines and other units.

Feon polyethylene filter fabrics has been announced by Filtration Fabrics Div., of Filtration Engineers, Inc., 155 Oraton St., Newark 4, N. J. This cloth, woven of polyethylene monofilaments, has a relatively open mesh, somewhat similar to fine wire cloth, and is recommended

principally for free-filtering applications such as coarse crystalline materials or fibrous pulps. It has high filtering efficiency, and does not blind or plug up in continuous operation. Its smooth filaments permit easy cleaning. Excellent chemical resistance gives the fabric long life. It resists alkalis as well as inorganic acids; and it is tough, abrasion-resistant, and has excellent flexing properties even at sub-zero temperatures.

The moto-truc reel handler, with electric hydraulic lift, has a capacity of 1600 lbs. It is designed for general factory and warehouse use or can be used as a stand for rolling or unrolling a reel. Overall size is 6 ft. x 6 ft.; the travel speed is 2½ to 3 miles an hour. Made by the Moto-Truc Co., 1939 East 59th St., Cleveland 3, Ohio.

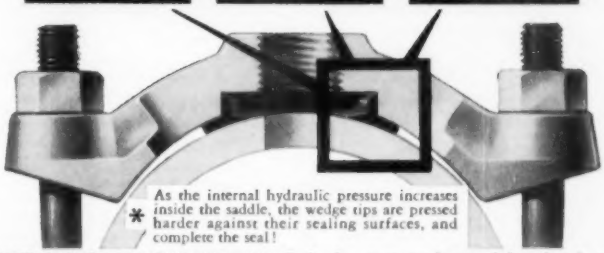
A low pressure pipe insulation for use on cold water, hot water or low pressure steam lines, has been announced by Owens-Corning Fiberglas Corporation, Toledo 1, Ohio. Due to its extra heat-stopping value a ½-inch thickness is generally sufficient. This material will not shrink, buckle or sag under changes in temperature and humidity. Primarily for indoor applications, it is suitable for outdoor use with addition of a waterproof jacket. Available with a canvas covering for hot water and low pressure steam lines and with a black jacket of asphalt saturated kraft paper for cold water lines.

This heavy-duty tractor-mounted subsoiler is designed for crawler tractors of 65 drawbar horsepower and larger, and is in production by American Tractor Equipment Corporation, Oakland, Calif. Tool pitch is adjustable. Maximum subsoiling depth below ground level is 30 ins. Standards connect to the tool beam with a pivoting pin so that tools can swivel to follow the tractor like a trailer. Standard beams accommodate deep plows, furrowers, ditchers, soil fumigating standards, brush and root cutters, etc.

Rubberchem pumps are now being manufactured by Eco Engineering Co., 12 New York Ave., Newark, N. J. They are suitable for corrosive fluids and have capacities up to ten gpm and 100 psi for sustained service. Internal parts are available in Type 316 stainless steel or monel, and all parts are interchangeable with Eco standard AllChem stainless steel or bronze process pumps.

SHURSEAL SADDLES

SEAL 3 WAYS*



* As the internal hydraulic pressure increases inside the saddle, the wedge tips are pressed harder against their sealing surfaces, and complete the seal!

A VELVET GLOVE FOR YOUR PIPE LINE! Only the most moderate tightening is needed on the ShurSeal Saddle. Merely tighten the nuts enough to prevent the saddle from shifting during the drilling operation, and your ShurSeal is made! Straps which are under less tension RESIST CORROSION BETTER. ShurSeal Saddle straps "hug" the pipe and eliminate bottom point pressure, insuring against crushing and breakage.

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FILTER BOTTOMS

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$5703-$6900
The City of East Orange, New Jersey is accepting applications from qualified Traffic Engineers, interested in serving a community of over 80,000 inhabitants, covering an area of four square miles.
Write to:
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Office of the City Engineer
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Qualified Doctor Available in the New York-Metropolitan Area
A medical doctor, a retired army colonel, well qualified in administration, health activities and medico-legal work, desires a position in the New York Metropolitan area. Amount of salary secondary. Recommended by the Editor of Public Works. Write to Box JB-4, Public Works Magazine, 310 East 45th St., New York 17, N. Y. Communications will be forwarded without acknowledgement.

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With FORMULA NO. 640
A clear liquid which penetrates 1" or more into concrete, brick, stucco, etc., seals—holds 1250 lbs. per sq. ft. hydrostatic pressure. Cuts costs: Applies quickly—no mixing—no cleanup—no furring—no membranes. Write for tecinical data—free sample.
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RATES TO PLEASE
Hotel LENOX
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Buffalo's hotel of distinction—air-conditioned, new Mt. Vernon dining room, new Grenadier cocktail lounge, new guest rooms and furnished apartments, designed by Ballard of N.Y.C.—Radio in every room—TV if desired. Free parking. Write today
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Learn latest methods to organize and run work. Prepare for the top jobs.
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Experienced in Municipal, Construction, Sanitary and Street Design. Seeks permanent position in South, prefers Municipal. Registered and employed at present.
WRITE TO BOX 4-1
Care of this Magazine

What you should know about
SOIL ENGINEERING
by LEO J. RITTER, JR.

SOIL engineering is the practical application of engineering principles to problems involving the use of soil, either in its natural condition or as a construction material. In this authoritative booklet all phases of soil engineering are treated in simple, easily understandable language. Full information is provided on basic soil properties, classification systems, field and laboratory tests, frost action and compaction. Liberally illustrated and containing many special charts and graphs to assist the engineer in his work.

ORDER from Book Department, PUBLIC WORKS, 310 East 45th Street, New York 17, N. Y. Only $1.00 per copy.

NEWS OF ENGINEERS

Richard H. Gould, who has been Director of the Division of Sewage Disposal of the New York City Department of Public Works, has joined the staff of Greeley & Hansen, consulting engineers of Chicago. William O'Leary succeeds Mr. Gould in the New York City position.

Guy E. Griffin has been appointed Deputy Commissioner of Public Works for Westchester County, N. Y., in charge of the Sewer Division. He will have supervision of the existing four county plants and also over the design and construction of the extensive program now under contemplation. Mr. Griffin has been with American Cyanamid Co. During the war, he served with the Quartermaster, Engineer and Sanitary Corps, in this country and overseas, reaching the rank of Lt. Col.

Sanitary Engineer Wanted

Large mid-west university needs a sanitary engineer this fall for full-time work in teaching. Salary depends on qualifications. Prefer man with MS or PhD. Many opportunities for research with a good number of graduate students. Limited amount of consulting work encouraged. Write Box 1-D, Public Works Magazine, which will forward applications without acknowledgement.

Distributors Wanted

Distributors are wanted to handle a 5000-cp kerosene burning floodlight projector, also a 2000-cp power inspection light and the Chalwyn kerosene burning danger lamp. No power required. Fine for water departments, street emergency repair work, fire departments, contractors and civil defense. Wm. W. Lee and Son, 20 E. Jackson Blvd., Chicago 4, Ill.

• • •

Worth Telling

(*More on page* 154)

★ **LOUIS F. FRAZZA** heads the new Transite pipe marketing section of Johns-Manville as manager of direct sales operations. Louis has been pushing this pipe since 1937 and we are happy to chronicle this recognition for him.

★ **HIGHWAY EQUIPMENT COMPANY,** Cedar Rapids, Iowa, puts a new

face, that of Philip Terry, into their eastern district sales department management. He headquarters in Carlisle, Pa. Spreaders is the product.

★ **N. F. S. RUSSELL**, chairman of the board of United States Pipe and Foundry Company, died in February in Burlington, N.J. Only last month we told of the passing of Birney Stokes, former vice president of U.S. . . . There were giants in those days, and we were privileged to know them.

★ **JOHN H. FORD**, another of that long and admirable line of "the Fords of Wabash, Indiana," becomes southeastern representative for Ford Meter Box Company, located in Greensboro, N.C.

★ **NEPTUNE METER COMPANY**, New York, acquires Revere Corporation of America, in Wallingford, Conn. Revere makes electromechanical instruments for measurement and control of liquids and temperatures; also toll-recording equipment for bridges, tunnels, and turnpikes.

★ **GOLDEN-ANDERSON VALVE SPECIALTY COMPANY**, Pittsburgh, has outgrown its former Pittsburgh offices and moved to 1232 Ridge Avenue, Pittsburgh 33. This follows the largest sales volume, in 1953, in the more than 50 years life of the firm.

★ **HEIL COMPANY**, Milwaukee, management and distributors met in January to trade ideas. Heil executives participating included Joseph F. Heil, president; John Barclay, general sales manager, and W. E. Curran, assistant to the president.

★ **THE OSGOOD COMPANY**, Marion, Ohio, announces the third step in their reorganization program. In effect, they now combine The Osgood Company and the General Excavator Company sales divisions for marketing their power cranes and excavators under the name *Osgood-General*. Sales and service policies are unchanged.

★ **BAPTISMAL NOTE:** A refugee water works man from drought-stricken Texas, en route to the beach to refresh his memory of what water looks like, told us that it was so dry down there that the Baptists were sprinkling, the Methodists using a damp wash cloth, and the Presbyterians issuing rain checks.

Engineered for...

Positive, Tight Closure—even air or bubble tight.
Automatic Control—electric, air, hydraulic, float, solenoid, etc. Or manual control, if desired.
Pressures—to 300 p.s.i. and higher.
Temperatures—from sub-zero to 2000° F.
Materials—made of any metal or rubber lined.
Sizes—from 1" to 120" diameter, and larger.

We also manufacture wafer type butterfly valves; slide and gate valves; proportioning valves; swing check valves. Write for Catalog.

W.S. ROCKWELL VALVES

W. S. ROCKWELL COMPANY
2524 Eliot Street • Fairfield, Conn.

Butterfly valve with outboard roller bearings, electric motor operator and auxiliary handwheel control, for high velocity air at 125 p.s.i. and temperatures from minus 20° to plus 200° F.

Since 1938 . . .

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City of Big Spring, Texas. Design: 20,000 population, 80 gallons per capita, 0.17 lb. B.O.D. with additional capacity for certain industrial wastes.

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3 *Simplest Operation and maintenance.* Operation and maintenance of a Contact Aeration Plant is extremely simple, requiring less operator attention and skill than most similar methods of treatment.

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FOR REPAIRING BELL AND SPIGOT JOINT LEAKS...

SKINNER-SEAL Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band — at spigot by hard vulcanized gasket tip. 2" to 42".

AND BROKEN MAINS

SKINNER-SEAL Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 24" incl.

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SOUTH BEND 21, INDIANA, U.S.A.

INCREASE SEWAGE PLANT CAPACITY WITHOUT CAPITAL COST!

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INDEX OF ADVERTISEMENTS

Aero Service Corp. 10
Alabama Pipe Co. 102
Albright & Friel, Inc. 141
Allis Chalmers Co. ..... 20 & 21, 61
Alvord, Burdick & Howson 141
American Bitumuls & Asphalt Co. 63
American Concrete Pressure Pipe Assn. 23
American Photocopy Equip. Corp. 144
American Playground Device Co. 103
Anderson A. C., Inc. 128
Anthracite Equipment Corp. 52
Aqua Survey & Instrument Co. 149
Armco Drainage & Metal Prod., Inc. 15
ARPS Corp. 60
Ayer-McCarel Clay Co., Inc. 155

Badger Meter Mfg. Co. 31
Baker & Co., Inc., R. H. 149
Baker, Jr., Michael, Inc. 141
Bannister Engineering Co. 141
Barber-Greene Co. 35
Barco Mfg. Co. 16
Barker & Wheeler 141
Baughman Mfg. Co., Inc. 127
Bell, Howard K. 141
Black & Veatch 141
Blackburn-Smith Mfg. Co. 114
Blaw-Knox Company 55
Blackson Chemcal Co. 18
Bogert Assoc., Clinton L. 141
Bowe, Albertson Assoc. 141
Bowerston Shale Co. 155
Brown & Blauvelt 141
Brown Engineering Co. 141
Buck, Seifert & Jost 141
Bucyrus-Erie Co. 41
Buffalo Mater Co. 51
Buffalo Pipe & Foundry Corp. 121
Buffalo Steel Div.
H. K. Porter Co., Inc. 133
Builders Providence, Inc. 22
Burch Corporation 111
Burgess & Nipple 141
Burke, Inc., Ralph H. 141
Burns & McDonnell Engr. Co 141
Butler Mfg. Co. 30
B/W Controller Corp. 44

Caird, James M. 141
Camp, Dresser & McKee 141
Capital Engineering Corp. 141
Carver Stimpson Pipe Cleaning Co. 111
Cast Iron Pipe Research Assn. ..... 12 & 13
Caterpillar Tractor Co. ..... 4, 32 & 33
Cayuga Rock Salt Co., Inc. 50
Centriline Corp. 116
Chain Belt Co. 109
Champion Corp. 54
Chester Engineers 141
Chicago Pump Co. 3
Clark-Wilcox Co. 42
Classified Ads 150
Cleveland Trencher Co. 56
Climax Engine & Pump Mfg. Co. 140
Clow & Sons, James B. 113
Cole & Sons, Chas. W. 141
Consoer, Townsend & Assoc. 141
Continental Steel Corp. 102
Corey Mfg. Co. 121
Cotton, Pierce, Streander, Inc. 141
Credle Engineering Co. 141

Darley & Co., W. S. 148
DeLeuw, Cather & Co. 141
Dempster Brothers, Inc. 135
Detectron Corp. 54
Dickey Clay Mfg. Co., W. S. 155
Dixon Jos., Crucible Company 28
Dodge Co., C. B. 121
Dotmar Industries, Inc. 132
Dresser Industries, Inc.
(See Dresser Mfg. Div.)
(See Roots-Connersville Blower Corp.)
Dresser Mfg. Div. 34
Dratt Mfg. Co. ..... 8 & 9
du Pont de Nemours & Co., E. I. ..... 37 & 53

Fairbanks-Morse & Co. 25
Federal Sign & Signal Corp. 45
Fisher Research Lab., Inc. 52
Flexible Pipe Cleaning Co. 108
Flexible Sales Corp. 64
Foster Engineering Co. 98
Foxboro Company 40

Gannett, Fleming, Corddry & Carpenter, Inc. 141
Gar Wood Industries Inc. 125
General Electric Co. 65
Gilbert Associates, Inc. 142
Golden Anderson Valve Specialty Co. 39
Graver Water Conditioning Co. 49
Greeley & Hansen 142
Green Co., Howard R. 142
Greenlee Bros. & Co. 132
Grote Mfg. Co. Inc. 44

Hames Products Co. 150
Harte Co., John J. 142
Hauck Mfg. Co. 144
Havens & Emerson 142
Hays Process Co. 151
Hazen & Sawyer 142
Healy-Ruff Co. 148
Heltzel Steel Form & Iron Co. 36
Hetherington & Berner Inc. 46
Hill & Hill 142
Homestead Valve Mfg. Co. 119
Hooper, Jr., William T. 142
Hotel Lenox 150
Hough Co., Frank G. 29
Hunt Machine Co., Rodney 57

Industrial Materials Co. 155
International Harvester Co. ..... 8 & 9
International Salt Co., Inc. 11
Irving Subway Grating Co., Inc. 153

Jaeger Machine Co. 131
Johns Manville 27
Jones, Henry & William 142
Josam Mfg. Co. 53

Kennedy, Clyde C. 142
Kerrigan Iron Works, Inc. 100
Knowles, Inc., Morris 142
Koehring Co. ..... 17 & 130
Kohler Co. 98

Lakeside Engineering Corp. 114
Leopold, F. B. 149
Lessmann Mfg. Co. 64
Lewis, Harold M. 142
Link Belt Company 6
Littleford Bros., Inc. 130
Lock Joint Pipe Co. 59
Lozier Co., Wm. S. 142
Lyle Signs Inc. 112

Maintenance, Inc. 115
McConnaughay, K. E. 129
McWane Cast Iron Pipe Co. 120
Metalab Equipment Corp. 48
Metcalf & Eddy 142
M & H Valve & Fittings Co. 136
Mueller Co. 2
Murdock Mfg. & Sup. Co. 154

Natco Corp. 155
National Clay Pipe Mfrs., Inc. 66
Neenah Foundry Co. 130
Nichols Engineering & Research Corp. 43

Oliver Corp. 47
Omega Machine Company 122

Pacific Coast Borax Co. 106
Pacific Flush Tank Co. 105
Pacific States Cast Iron Pipe Co. 120
Palmer & Baker, Inc. 142
Palmer Filter Equip. Co. 42
Phelps Dodge Refining Corp. 138
Phelps, Inc., Boyd E. 142
Pirnie Engineers, Malcolm 143
Pitman Mfg. Co. 48
Pitometer Associates, Inc. 143
Pollard Co., Inc., Jas. G. 104
Pomona Terra-Cotta Co. 155
Preload Engineers, Inc. 143

Radiator Specialty Co. 131
Ranney Method Water Supplies, Inc. 58
Reliance Chemicals Corp. 152
Ridge Tool Co. 24
Robert & Co., Associates 143
Roberts Filter Mfg. Co. 154
Rockwell W. S. Co. 151
Roots-Connersville Blower Corp. 26
Royer Foundry & Machine Co. 117
Russell & Axon 143

Seay Co., Irby 143
Sewerage Manual & Catalog File 62
Skinner Co., M. B. 152
Smith & Gillespie 143
South Bend Foundry Co. 148
Spanski & Williams 143
Sparling Meter Co. 123
Stanley Engineering Co. 143
Stilson Assoc., Alden E. 143

Tennant Co., G. A. 110
Texas Vitrified Pipe Co. 155
Todd Shipyards Corp.
Combustion Equip. Div. 123
Trickling Filter Floor Institute 155

Uhlman & Associates 143
Union Metal Mfg. Co. 19
U. S. Pipe & Foundry Co. 137
Universal Concrete Pipe Co. 14

Wallace & Tiernan Co., Inc. ..... Back Cover
Warrick Co., Charles F. 52
Watkins, J. Stephen 143
Whitman, Requardt & Assoc. 143
Wolverine Tube Division
Calumet & Hecla, Inc. 107
Wood Co., R. D. 124

—Worth Seeing

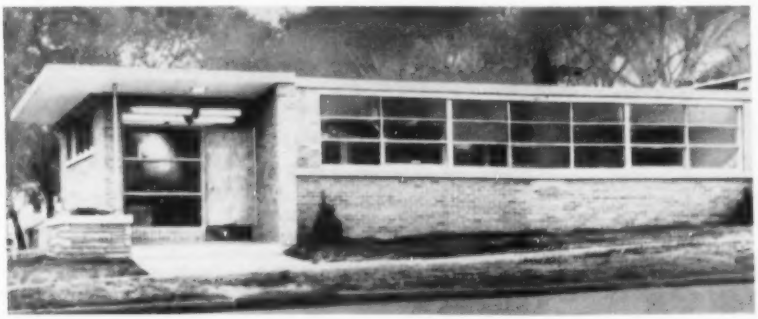
The eyes have it this month! Otherwise, a scene from the big Butler Mfg. Company three-days sales meeting in Kansas City. See the Butler ads in your PUBLIC WORKS for story of their line of steel buildings.

Keep your eyes on the Distometer! It replaces rules, tapes, yardsticks, and headaches in measuring short distances accurately. Rolatape, Inc. 1741 14th St., Santa Monica, Calif., is the address for the Distometer. The other is in our own little black book only.

Bucyrus-Erie Co., South Milwaukee, Wis., developed this new heavy-duty 22-B crane excavator. Added features are a long frame crawler mounting, fast drag-lining, and heavy duty boom to increase work load capacity.

Timber-r-r!

New Homelite Corporation lighter faster Model 17 chain saw tackles a big tree. This saw weighs only 22 pounds and delivers 3½ brake horsepower.



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WORTH TELLING

by Arthur K. Akers

★ **WE HAVE** just realized that the artist to whom we sat for the above portrait has done what neither science, prayer, nor our barber could do: he gave us back our hair.

★ **NEW PRESIDENT F. G. MERCKEL** of Wallace & Tiernan Inc. announces: Robert T. Browning as

Mr. Browning

Mr. Merckel

vice president in charge of sales, Wallace & Tiernan division; director of sales, William A. Hockett; manager of field sales and service, Russell C. Clement; manager of departmental sales, Vincent Pisani. Also, Thomas T. Quigley, formerly advertising and sales promotion manager, advances to assistant to the president and operational analyst; succeeded by O. S. Porter in advertising.

★ **DESERVING** a whole page by himself if we had it, comes announcement of William J. Orchard's retirement from active general managership at Wallace & Tiernan to an honored place on the board of directors, and we hope just a little well-earned leisure. Not that we can ever imagine Bill Orchard as inactive at any time or place!

★ **PACIFIC FLUSH TANK COMPANY,** Chicago, has moved its eastern offices from New York to the Tyler Building in Port Chester, N.Y. L. L. Langford, their manager, can be phoned now at PO 5-6212.

★ **B-I-F INDUSTRIES,** Providence, announces new directors including John R. Hartley, a Builders-Providence vice president, Roland J. Leveque, sales manager for Omega Machine Company and R. W. Pearce, manager of Chlorinizer sales. We congratulate both them and B-I-F. At Builders-Providence, Glenn Hawkins is named application engineer to assist R. W. Pearce, manager of Chlorinizer sales.

★ **ARTHUR C. LUNDAHL** has been elected president of the American Society of Photogrammetry, Bob Sohngen, advertising manager of Aero Service Corporation, Philadelphia, informs us.

★ **ADDITIONAL OFFICERS** elected by McWane Cast Iron Pipe Company, Birmingham, are O. Harvey King, vice president, who remains also vice president and treasurer of the affiliated Pacific States Cast Iron Pipe Company at Provo, Utah; also, W. P. Cox, formerly general sales manager, and A. W. Claussen, works manager, become vice presidents in Birmingham. P. M. Lovell, formerly auditor, advances to secretary and treasurer of the McWane Company. We "knew them when" and publish this with pride.

★ **CITY TANK CORPORATION** expansion creates two new positions. Arthur L. Hettler, is promoted from assistant general manager to vice

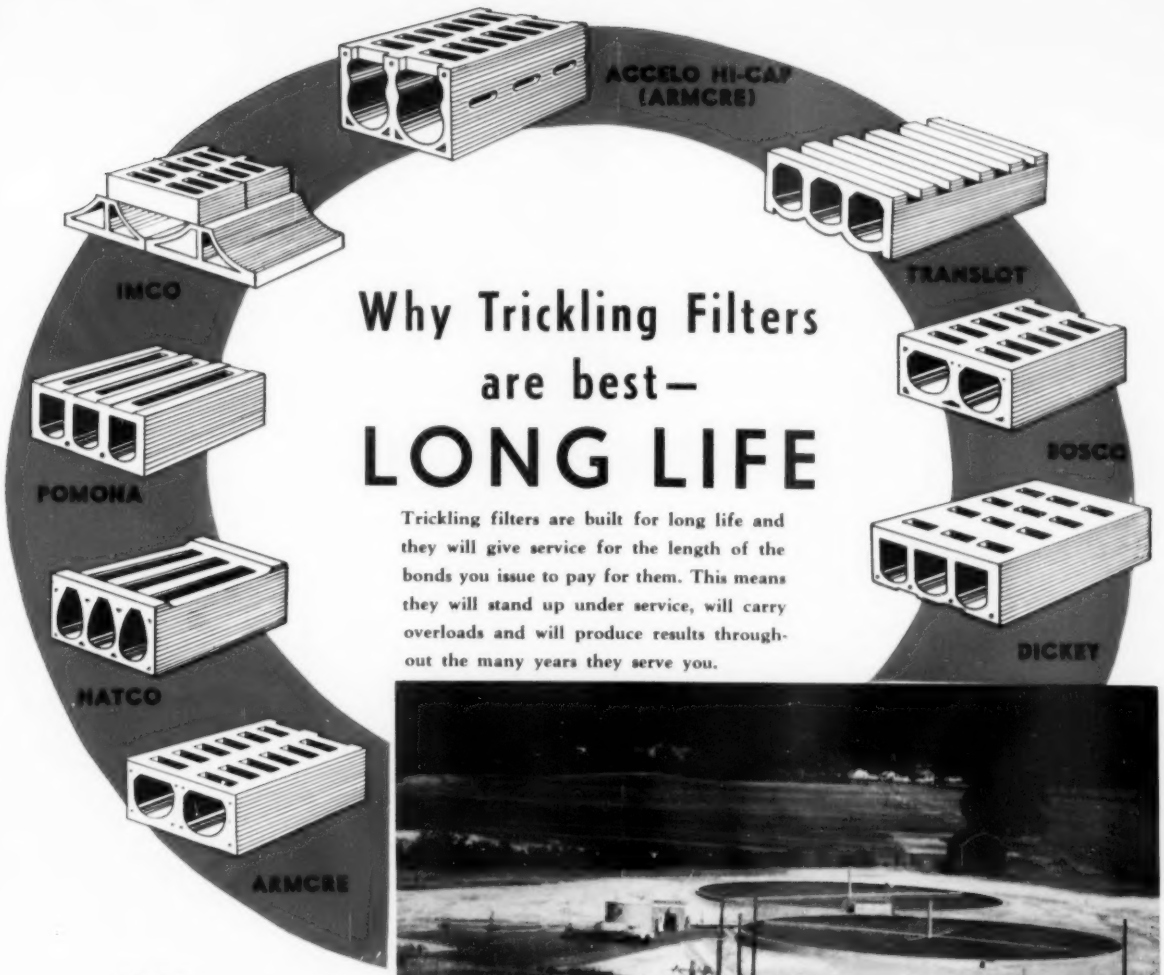
Mr. Hettler

Mr. Brown

president and works manager; Paul H. Brown, former sales manager, to vice president in charge of sales. Roto-Pac refuse collection units and street flushers are your interest here.

★ **DR. RAYMOND B. SEYMOUR** becomes president of Atlas Mineral Products Company, Mertztown, Pa., succeeding George L. Wirtz, now chairman of the board.

More "Worth Telling" on pages 150 and 151.



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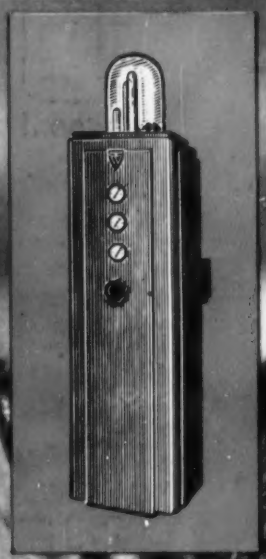

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